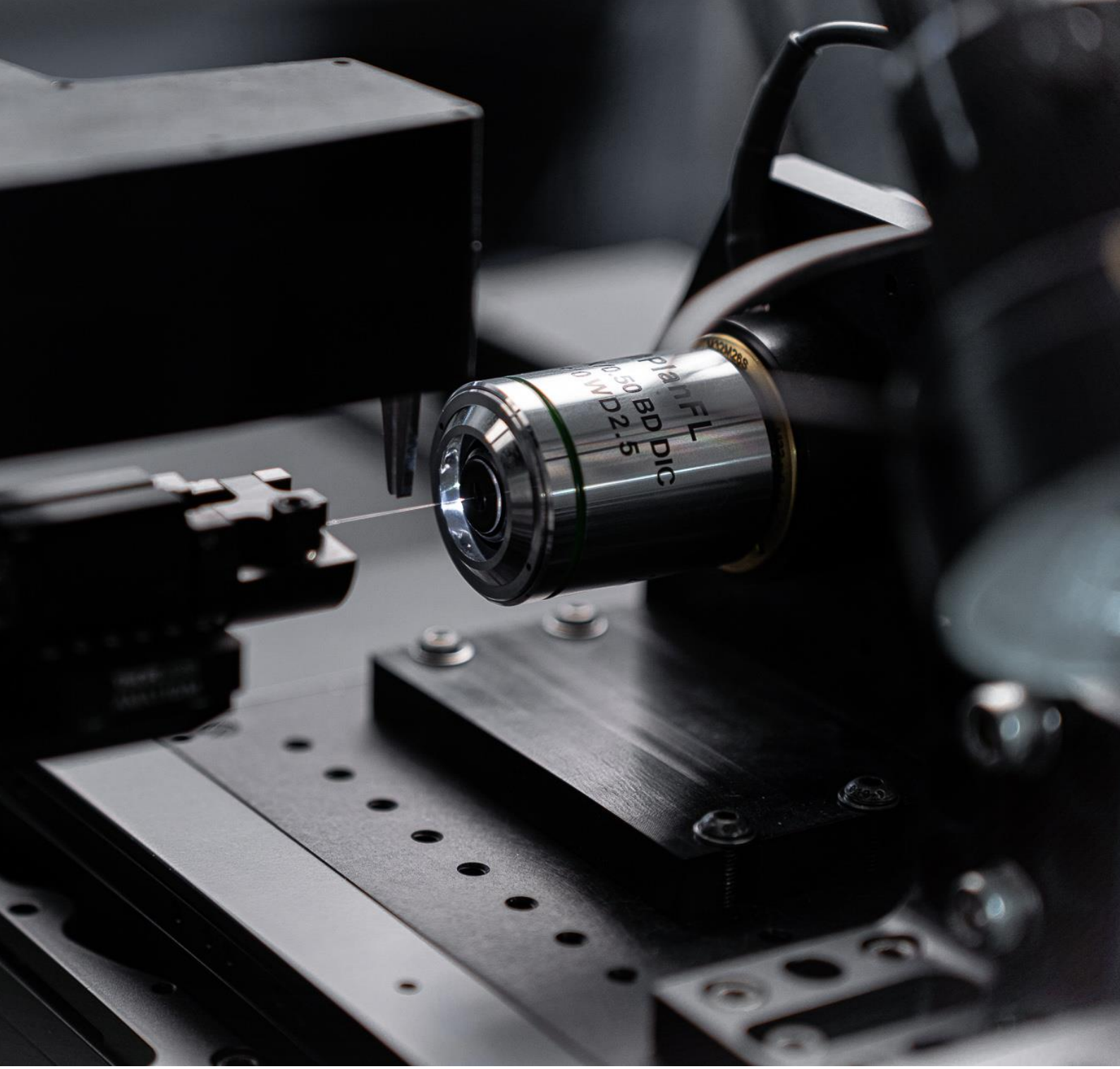


ELECTRONICS AND PHOTONICS
INNOVATION CENTRE

CAPABILITY DOCUMENT

epic

EPIC – An Introduction

The Electronics and Photonics Innovation Centre (EPIC) was built to support the needs of the rich local electronics and photonics cluster. The concept is to provide modern workspace for technology businesses to help and encourage their growth.

In addition to offering premises (labs and offices) to businesses, EPIC also support its businesses with equipment and facilities to help achieve innovation. In fact, tenants located within the centre have access to an extensive range of apparatus to substantially increase their technical capability.

This document provides an overview of the equipment and facilities located within the centre.

Classified Class 7 Cleanroom

One of the many shared facilities located in the centre is a fully classified cleanroom. This capability enables tenants to offer products assembled in a controlled environment.

Having an in-house cleanroom supports our tenants' expansion into sensitive markets such as:

- MedTech
- Aerospace
- Space
- Defence

The cleanroom has a tablet that records critical factors such as temperature and humidity.

Cleanliness is closely monitored using a **Particles Plus 8306 6 Channel Particle Counter** which can be accessed remotely.

Piped-in Services

EPIC has invested in Compressed Dry Air (CDA) and Nitrogen capability both of which are piped into various units throughout the building.

Nitrogen is supplied through an **Omega N-GEN 05** generator and CDA through **KAESER's SM series** rotary screw compressors with an **Atacama** dryer.

The supply of these services is offered to EPIC tenants at no additional cost. This enables businesses to make savings on their own hardware and removes the need to purchase nitrogen cylinders.

EPIC Prototyping Suite

The electronics world is constantly evolving with a requirement for smaller, faster and more reliable technology. Getting a fully tested, cost effective product to market in a timely fashion is therefore a challenge. This becomes even more difficult without the right facility, expertise and equipment.

EPIC has consequently populated its own **Prototyping Suite** with as much equipment as possible to facilitate the R&D process. This shared laboratory is available for tenants to use with most of the equipment available at no additional cost.

Palomar Technologies

EPIC has chosen industry specialist **Palomar Technologies** as one of its key technology partners to support with tenants' prototyping needs. Palomar is a leading supplier of automated microelectronic assembly machines with specialisation in precision die attach, wire bonding and vacuum reflow processes.

The manufacturer has links to the local area and has supplied several businesses within the cluster and is therefore well known and respected. Furthermore, several local businesses have experience using Palomar products.

Palomar equipment was selected for both die bonding and wire bonding processes in the centre.

Die Bonding

Die Bonding is the widely recognised technology used to interconnect electronic and photonic chips (semiconductors).

The first significant piece of Palomar equipment installed within EPIC was a **3880 Die Bonder component placement die attach system.**

This model is the fastest and most reliable multiple die-type bonder on the market. In fact it has outstanding capability in terms of **speed**, **repeatability**, **placement accuracy**, and size of **work area**.

The **3880** offers capabilities that would ordinarily require at least four separate machines (eutectic die bonding, material dispensing, flip chip and UV bonding).

The 3880's versatility will support multiple applications, these include:

- Optical Transceivers
- 5G Power Amplifiers
- LiDar Products
- AOC- Active Optical Cable
- Chip-on-Carrier (CoC)
- Chip on Board (COB)
- Automated Passive Optics Assembly

Die Bonding - continued

- Gold Box Assembly
- High Brightness/Power LED Assembly

- Microwave Modules
- RF Packages
- Hybrid Microcircuits (MCM)
- VCSEL, PD, DFB Laser, and Lens Attach
- Solid State Lasers
- MEMS / MOEMS
- LED Printhead Attachment
- RF Power Amplifier
- Solar Concentrator Packaging

The 3880's Capabilities Include:

- Both pulsed heat and steady state stages for eutectic attach
- Flip chip (90° - 180°)
- Twin fluid dispensers. Volumetric and jetting for epoxy, adhesives, sinter, solder paste, encapsulation, glob top, potting and under fill.
- Epoxy daub and stamp
- In-situ UV cure kit
- Presentation options include wafer, 2" and 4"waffle/gel pak, tape and reel, Auer boats and custom carriers

Wire Bonding – Ball (stud) Bumper

Wire bonding is technology used to connect electronic and photonic chips (semiconductors) to an electronic circuit using gold wire.

To complement the capability of the 3880, EPIC has also invested in wire bonding capability with the purchase of the Palomar 8000i.

A fully automated thermosonic high-speed, ball-and-stitch wire bonder capable of ball bumping, stud bumping, wafer bumping, chip bumping, and customized looping profiles. Well suited for many aspects of packaging and component assembly, including complex hybrids, MCMs, and high-reliability devices.

Based on Palomar's proven wire bonder design and incorporating the latest productivity technology and operator ergonomics, making it the next generation of fine wire bonders.

The 8000i's Capabilities include:

- Ball Bumping
- Gold Wire Bonding
- VisionPilot®
- Bond Data Miner
- Intelligent Interactive Graphical Interface® - i2Gi®
- Vision Standardisation
- Automated Handler System
- Digitally Controlled NEFO Generator

These two bonding machines offer EPIC a comprehensive assembly services capability for multiple applications.

This will give users the opportunity to assemble their products using advanced technology that has been proven at other international Innovation Centres.

Having access to the equipment will improve first pass yields, reduce costly scrap and rework loops. This will consequently help get products to market within acceptable timescales at a reduced cost.

There is also the option for this equipment to be used for larger manufacturing batches once prototypes have been approved.

Microscopy and Analysis

A significant part of the R&D process is proving a concept and being able to back up claims with data and photographic evidence.

EPIC therefore chose to work with industry-leading suppliers of microscopy and analysis equipment. Three key pieces of apparatus were subsequently added to the Prototyping Suite to enable users to accurately measure and inspect their products.

Nikon Metrology, JEOL, XYZTEC and **Mitutoyo** were all subsequently chosen to partner with EPIC to supply this capability.

Scanning Electron Microscope (SEM)

Having a SEM capability within EPIC enables users to view their products or components in fine detail.

The centre has therefore purchased the latest in benchtop SEM technology from Nikon. The **JCM-6000Plus "NeoScope™"** is a touch panel controlled, multifunctional desktop scanning microscope. The JCM-6000Plus is equipped with the high-sensitivity semiconductor detectors found in high-end instruments, making it easy to acquire contrast information about specimen composition, and enabling efficient analysis.

The SEM includes high-vacuum functionality and secondary electron detector, offering the ability to clearly observe fine structures on the specimen surface at high magnification.

The JCM-6000Plus' Capabilities include:

- Secondary electron imaging and backscattered electron imaging supported at high vacuum
- New high sensitivity solid state backscattered electron detector provides both composition and topographic imaging information
- Dual frame imaging to facilitate comparison of live and retrieved images

- A wide magnification range from 10x (for wide area of view) up to 60,000x.

- **EDS (elemental analysis device)** capability together with a **JEOL Smart Coater** for gold and platinum.

- **Tilt/rotation** motor drive specimen holder allows the operator to tilt and rotate the sample for well-focused **3D morphological observation.**

Bond Testing

Bond testing of products is usually a process that needs to be subcontracted to a third party as part of the R&D process. Having an in-house tester therefore offers this capability and a huge advantage to EPIC tenants.

The centre therefore purchased **a Condor Sigma** bond tester from **XYZTEC**.

The Condor Sigma is the most advanced bond tester on the market. The product also boasts unparalleled 0.075% accuracy, the best ergonomics and highest throughput. The product can complete the following tests:

- Ball shear
- Bending test
- Calliper
- Cavity shear
- Cold bump pull
- Die shear
- Fatigue test
- High speed impact test
- Overhanging die
- Passivation layer gold ball shear
- Probe
- Ribbon peel
- Ribbon pull
- Solder ball shear
- Stud pull
- Total ball shear / zone shear
- Tweezer pull
- Vector pull
- Wedge and ribbon shear
- Wire pull
- Creep test
- Lead integrity / micro torsion
- Lid torque
- SMD shear
- Spring rigidity
- Copper pillar
- Loop height

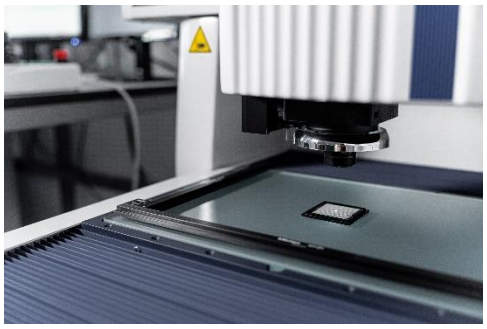
Users will undoubtedly benefit from the flexibility of the product and being able to access all these capabilities from EPIC.

Vision Measuring System (VMS)

Having apparatus within EPIC that is multifunctional to accommodate various applications and users is very important.

The centre added VMS capability by purchasing the **Quick Vision Apex Pro** from **Mitutoyo**.

The model was carefully selected to offer a variety of measuring capability to suit both current and future EPIC tenants.



The system has the following capability:

- Triangular pattern focussing for low-contrast surfaces
- Programmable magnification changer 1X, 2X and 6X
- High-precision interchangeable objective lens system, with 1X and 2.5X supplied as standard

- High-resolution CCD black and white camera
- Scale Resolution 0.1 µm (0.0001 mm)
- User-friendly QVPAK software
- One click tool technology for optimum edge detection
- Flexible QV Basic programming language.
- White LED transmitted stage light

This VMS is currently very popular with EPIC tenants and a great asset to the Prototyping Suite.

Plasma Cleaning & Etching

Preparing components for assembly is an important part of the prototyping process.

As with lots of equipment purchased for the Prototyping Suite, many businesses would not be able to afford or justify owning their own **Plasma Cleaning System**. Having shared equipment however offers businesses access to technology that will significantly improve the quality of their products without the initial expenditure.

Industry specialists, **Henniker Plasma,** were very keen to partner with EPIC and were very supportive with the plasma cleaning needs of the centre. EPIC purchased a **HPT-200** fully loaded with additional accessories and functionality.

The system is suitable for routine surface **cleaning** and **activation** for a wide range of materials.

It features precision mass flow-controlled gas inlet (single or dual), a touchscreen interface and robust and reliable 40kHz plasma generator with fully variable power delivery.

- Plasma cleaning
- Plasma surface activation to improve adhesion
- Functional plasma coatings
- Plasma etching
- PDMS & microfluidic devices
- PEEK & other engineering polymers
- PTFE
- Metals
- Ceramics
- Glass & optical devices

The system is extremely simple to use with front panel touch interface providing interlocked pump down, process and vent cycles with a single key press.

Device Packaging

In order to achieve high quality, repeatable production sealing of Hybrid style packages, the equipment used, must be designed and manufactured to ensure its own robustness and reliability are guaranteed. To support this, EPIC has purchased a full hybrid package sealer system from packaging experts, Pyramid Engineering. The **HPS 10-19 Hybrid Package Sealer** can guarantee reliability not once, but every time products are sealed.

- Suitable for square, rectangular, vertical lead and circular packages.
- Dimensional range between 2 to 152 mm, with plain or step lids up to 0.5 mm thick.

Device Packaging - continued

- Sealing specification better than 1 x 10-9 mbar 1-1 with high production yields
- Positional accuracy < to ± 0.025 mm.
- Repeatability within 0.025 mm
- Automatic height and pressure adjustment of welding electrodes relative to the package,
- Controllable soft contact to minimise mechanical shock.
- Real time pressure measurement and power option for PC control
- Easy to use menu driven software with multi-level password protection, of process data and real time execution of servo drive positional control. Data storage on hard disk with network expansion.
- High frequency, Synchronous and Capacitron welding power supplies, utilising high density welding wheels to minimise package temperature.

EPIC has onsite leak detection equipment in place to verify these processes.

Environmental Simulation and Product Storage

It is essential to provide ancillary items within the building to prepare and store products both before and after the prototyping process. EPIC has identified and purchased equipment that ensures this is available within the facility

Drying and Heating Chambers

EPIC has two fully programmable material test chambers for tenants to use. These are **Binder FP115 Chambers** with the following capability:

- **Temperature range: room temperature plus 5 °C to 300 °C**
- **APT.line™ preheating chamber technology**
- **Adjustable fan speed**
- **Adjustable exhaust air flap**
- **Controller with time-segment and real-time programming**
- **2 chrome-plated racks**
- **Class 2 independent adjustable temperature safety device with visual alarm**

To further enhance the functionality of these chambers, EPIC has purchased a **multi management software system** for logging, controlling, monitoring and documenting activity.

Nitrogen Cabinets

EPIC offers the facility to store products in a controlled and safe environment. Nitrogen cabinets (<5%RH) are available in the **Prototyping Suite** in addition to our **Classified Cleanroom**.

These cabinets are specially designed for moisture sensitive devices of level 4, 5, 5A, or 6. They can eliminate oxidation of stored parts which makes them perfect for sensitive electronics parts.

Shared Software Licences

It is often difficult for businesses to afford or justify purchasing software for certain applications. The concept of shared licences for multiple users to periodically access is therefore a perfect solution for many businesses,Software is installed in a shared server room that is accessible remotely to all EPIC tenants.

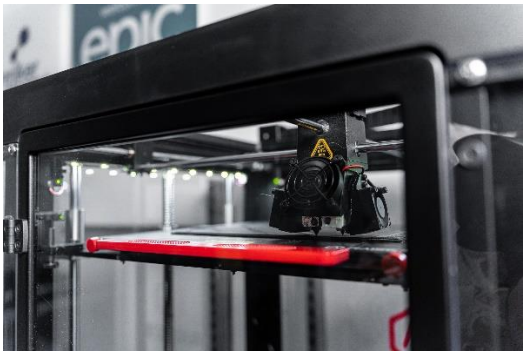
Solidworks Premium 2022

- Part and Assembly Modelling
- 2D Drawings
- Design Reuse and Automation
- Collaborate and Share CAD Data
- Interference Check
- First-Pass Analysis Tools
- CAM Programming (SOLIDWORKS CAM)
- Design for Manufacturing (DFM)
- Productivity Tools
- Advanced CAD File Import/Export and Interconnect
- CAD Libraries (SOLIDWORKS Toolbox)
- Design for Cost (SOLIDWORKS Costing
- ECAD/MCAD Collaboration (CircuitWorks)
- CAD Standards Checking (Design Checker)
- Collaboration with eDrawings Professional
- Automated Tolerance Stack-Up Analysis (TolAnalyst)
- Advanced Photorealistic Rendering (SOLIDWORKS Visualize)
- SOLIDWORKS File Management
- Reverse Engineering (ScanTo3D)
- Time-based Motion Analysis
- Linear Static Analysis for Parts and Assemblies
- Pipe and Tube Routing
- Electrical Cable and Wiring Harness Routing
- Advanced Surface Flattening
- Rectangular and Other Section Routing

In-house 3D Printing

A perfect product to complement the Solidworks Premium software is 3D printing capability.

EPIC has consequently invested in a **Raise3D Pro 2 Plus** printer that offers excellent capability to all tenants.



The Raise3D Pro 2 Plus' capabilities include:

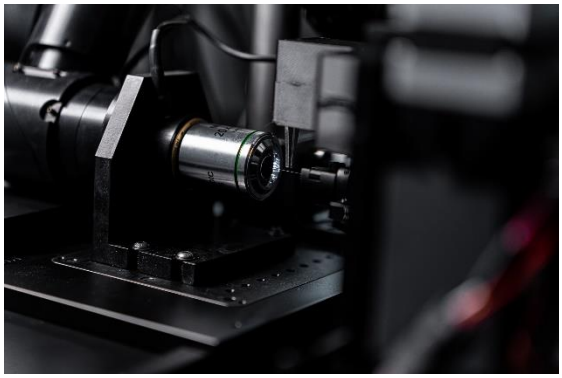
- Print Technology: FFF
- Build Volume: 305x305x605mm
- Machine Size: 616x590x1107mm
- Print Head: Dual-Head with Electronic Lifting
- System
- Filament Diameter: 1.75mm
- XYZ Step Size: 0.78125, 0.78125, 0.078125 micron.

3D Printing - continued

- Print Head Travel Speed: 30-150 mm/s
- Build Plate: Heated Aluminium Build Plate
- with Magnetic Holding
- Max Build Plate Temperature: 110°C
- Build Plate Material: Silicone
- Build-Plate Levelling: Pre-Calibrated Levelling
- Materials: PLA, ABS, HIPS, TPU, PC, Nylon,
- TPE, FLEX, PETG, Metallic PLA, Wood PLA,
- Carbon Fibre, etc
- Nozzle Diameter: 0.2, 0.4, 0.6, 0.8mm
- Max Nozzle Temperature: 300°C
- Operating Sound: 50 dB
- Connectivity: Wi-Fi, LAN, USB Port
- Monitoring: Live Camera

Fibre Alignment (NEW)

A significant area of recent investment has been the introduction of EPIC's own bespoke flexible alignment workstation.



This system has been purpose-designed and manufactured in collaboration with EPIC tenants and, nanopositioning specialist, Prior Scientific.

This alignment capability breaks new boundaries and is the world's longest travel multi-axis piezo nanopositioning stage.

The system was designed and manufactured to offer convenient and flexible access for multiple users.

Key features include:

- Allows use of different fibre diameters and optical inspection of fibre end.
- Rotational adjustment for correct orientation of the fibre.
- Once inspection is completed, the fibre is moved across to the packing system using joystick control of the XY stage.
- The system helps actively align the optical fibre pigtail assisted by a nanopositioning robotic arm such that it can be fixed in position.
- Signal intensity monitor for optimum alignment.
- Stage can be automated to position the fibre for repeat insertions into a package.
- Twin Navatar Zoom optic systems allow visual monitoring of package throughout the alignment process.
- Allows use of different packaging formats or alignment to chip/photo transmitter or receiver.
- Modularity of components.
- Stage motion has potential to be automated to scan to find optimum position and hold the fibre in position for gluing.

Future Investment

Although EPIC already has impressive technical capabilities, it has ambitious plans to increase its capability in the upcoming months.

With prototyping capability already in place, EPIC is currently looking at additional capabilities that are likely to include both equipment and additional shared software licences.

ELECTRONICS AND PHOTONICS
INNOVATION CENTRE

JOIN THE INDUSTRY SPECIALISTS ALREADY LOCATED WITHIN EPIC:

Accessing this Capability

The equipment listed in this document is freely available to EPIC tenants.

To learn more about the incentives available to become an EPIC tenant please get in touch.

Electronics & Photonics Innovation Centre

White Rock Business Park
Waddeton Close, Paignton
Devon, TQ4 7RZ, UK

Tel: +44 (0) 1803 714 715
Email: wayne.loschi@tda.uk.net
Website: www.epic-centre.co.uk