**Specification**

**Introduction**

Innovations Technology Access Centre - Micro & Nano Technology group (ITAC-MNT) operates within the Business Innovation Directorate of Science & Technology Facilities Council (STFC) based at Rutherford Appleton Laboratories.

Our Cleanroom facility is unique in offering an “Open-Access” approach for Tenants, Off-site users and other STFC departments so that Customers can be trained and then have access to run & develop their own products on these tools. This gives SME companies, University students and other Industry Users open-access to semi-conductor machinery only otherwise situated in dedicated Large-Corporation Companies or Research Labs.

**Aims**

Two DRIE Multiplex ICP systems form an essential part of ITAC-MNT’s toolset offered to our Tenants and Cleanroom Users. They use incompatible gases and processes to etch very different materials. These two machines cannot be replaced by one tool.

One system (STS1) is setup using Fluorine chemistry for deep silicon etching for Microelectromechanical systems (MEMS) type devices:-

* Silicon micro-machining
* MEMS - Actuators, micro-motors
* Bio-MEMS – micro-fluidic channels for use in lab-on-a-chip devices

The second system (STS2) is setup using Chlorine chemistry for etching of exotic materials such as Sapphire, GaAs and other compound III-V semiconductor materials used in high performance electronics and optoelectronics.

The two DRIE systems (STS1 and STS2) require upgrading because they run obsolete software and use obsolete computers that have become too difficult to repair and maintain.

If the machines no longer run then either a new system needs to be purchased or refurbishment of the system needs to be undertaken; otherwise we will lose part of our capability that we can offer. This will ultimately have an effect on both our income and the level of services we can offer to Customers.

We require the two systems to be refurbished by a Specialist company.

**Objectives**

* + We require two systems to be refurbished.
	+ De-commissioning with minimal impact on Users of our Cleanroom.
	+ A new software system + PCs to control it are needed.
	+ A new program to run the machines is needed.
	+ The software system needs to be integrated into the existing tool & with existing supplied services (gases controlled by MFC, vacuum, power etc.)
	+ The two systems need to be re-installed in the place where they were removed from.
	+ Commissioning / Acceptance Testing - The two systems need to be demonstrated to work with the new PC control in the same way as the original software.

**Background**

* Both machines are >15 years old
* Both machines run Windows 3.1 software – which is now obsolete

**Scope**

System Refurbishment of 2off STS Systems to include:-

* The systems need to be decommissioned (from a working cleanroom environment) and transported to Refurbishment Company’s site.
	+ De-commissioning with minimal impact on Users of our Cleanroom.
	+ Contractor must display suitable Manual handling methods.
	+ Contractor must display a Method statement for de-commissioning & safe removal to their place of work.
	+ There are Health & Safety requirements of COSHH as one machine has had Chlorine / BCL3 in the main chamber. The other machine has had SF6 / C4F8 in the main chamber.
	+ Contractor must have risk assessments.
	+ Contractor must have insurance to cover machines for travel & whilst at Contractor’s premises. Insurance value £100k for each machine (£200k total).
* The systems need to be dismantled, mechanical components cleaned and refurbished as necessary.
* Control equipment needs to be assessed. The refurbishment on both systems will involve the integration of a new PLC based control system with a new PC, including a complete re-wire of both systems.
* A new program to run the machines is needed. It needs to be compatible with the separate modules of the machine that it will drive. (RS232 compatible).
* The operating software needs to be configured to function in a similar way to that of the original systems.
* The machine should be able to be run in MANUAL/SERVICE mode as well as STANDARD mode
* On completion of the refurbishment, the systems must be re-installed and commissioned in the Laboratory.
* Commissioning / Acceptance Testing stage must be completed.
	+ On completion the systems must be demonstrated to be working as expected. STS1 is a switched-Bosch process etch in silicon, STS2 is a chlorine-based etch on sapphire wafers.
	+ Training on the new software/PC needs to be included.
	+ Training for maintenance purposes to run the machine in MANUAL/SERVICE needs to be included
* Guarantee / Warranty for minimum 12 months, ideally 2 years
* Service Support / parts for 5 years on new Software & Operating system
* Service support on Hardware of machine for 5 years.

Not included:-

* The refurbishment of the System vacuum pumps are not included.

**Requirement**

1. Refurbishment of the STS 1 System to the following specification:

* De-commissioning & safe removal from site.
* Wiring and equipment removed from system mainframe.
* Chamber and vacuum components cleaned and assessed.
* System mainframe to be cleaned and made ready to accept new wiring harness.
* Power distribution unit to be checked for correct operation and adapted to suit new control system.
* PLC control system with new PC (possibly touchscreen interface) to be integrated into system frame. PC Controls / Touch screen to be fitted into Cleanroom for operator access, a second screen to be fitted in the Service Corridor area for maintenance and engineering.
* New program to operate machine to be written. It needs to be compatible with the separate modules of the machine that it will drive. (RS232 compatible).
* The machine should be able to be run in MANUAL/SERVICE mode as well as STANDARD mode
* System wiring diagrams to be drawn up, to include the control equipment that is

being re-used.

* A full functional test to be carried out on completion of the refurbishment, this is to also include a full safety audit and RF emission checks.
* On completion of the refurbishment, the systems must be re-installed and commissioned in the Laboratory.
* Commissioning / Acceptance Testing stage must be completed.
* On completion the systems must be demonstrated to be working as expected. STS1 is a switched-Bosch process etch in silicon, STS2 is a chlorine-based etch on sapphire wafers.
* Training on the new software/PC needs to be included.
* Training for maintenance purposes to run the machine in MANUAL/SERVICE needs to be included
* Gas box refurbishment to be carried out in conjunction with the system refurbishment. The work required is to allow integration of the original Massflow controllers and isolation valves into the control system.
* The process chamber gauging to be replaced with new units to include a 1Torr CM Gauge a heated 0.1 Torr CM Gauge and a WRG unit.
1. **Refurbishment of the STS 2 System to the following specification:**
* De-commissioning & safe removal from site.
* Wiring and equipment removed from system mainframe.
* Chamber and vacuum components cleaned and assessed.
* System mainframe to be cleaned and made ready to accept new wiring harness.
* Power distribution unit to be checked for correct operation and adapted to suit new control system.
* PLC control system with new PC (possibly touchscreen interface) to be integrated into system frame. PC Controls / Touch screen to be fitted into Cleanroom for operator access, a second screen to be fitted in the Service Corridor area for maintenance and engineering.
* New program to operate machine to be written. It needs to be compatible with the separate modules of the machine that it will drive. (RS232 compatible).
* The machine should be able to be run in MANUAL/SERVICE mode as well as STANDARD mode
* System wiring diagrams to be drawn up, to include the control equipment that is
* being re-used.
* A full functional test to be carried out on completion of the refurbishment, this is to also include a full safety audit and RF emission checks.
* On completion of the refurbishment, the systems must be re-installed and commissioned in the Laboratory.
* Commissioning / Acceptance Testing stage must be completed.
* On completion the systems must be demonstrated to be working as expected. STS1 is a switched-Bosch process etch in silicon, STS2 is a chlorine-based etch on sapphire wafers.
* Training on the new software/PC needs to be included.
* Training for maintenance purposes to run the machine in MANUAL/SERVICE needs to be included
* Gas box refurbishment to be carried out in conjunction with the system refurbishment. The work required is to allow integration of the original Massflow controllers and isolation valves into the control system.
* The process chamber gauging to be replaced with new units to include a 1Torr CM Gauge a heated 0.1 Torr CM Gauge and a WRG unit.

**Milestone Payments**

* STS1 removed from cleanroom and transported to Contractor’s site.
* STS2 removed from cleanroom and transported to Contractor’s site.
* New computers / software systems + PLC control systems + working machine program completed offsite for STS1.
* New computers / software systems + PLC control systems + working machine program completed offsite for STS2.
* STS1 fitted into Cleanroom, integrated with Services & demonstrated to be working as expected. Commissioning / Acceptance Testing stage.
* STS2 fitted into Cleanroom, integrated with Services & demonstrated to be working as expected. Commissioning / Acceptance Testing stage.