1. Introduction

The Meso platform is a novel research system that challenges a number of the typical machine tool conventions. It is specified at a leading performance for an ultra precision diamond machining system; yet it is also specified to been highly integrated, compact and configured to have low energy consumption.

Design constraints included operating from a single phase supply, maintaining high precision and milli-Kelvin thermal control with highly automated tool and work-piece transport mechanisms.

2. Precision and Production Performance

The target accuracy and productivity performance for the Meso machine has been set at the level of the highest performing traditional ultra precision diamond turning machines; 1-10 nm Sa surface roughness levels and form accuracy in the sub 50 nm RMS region. Traditional machines are typical 10 times larger by volume and consume significantly more energy than the Meso platform machine.

The Meso platform will verify both highly integrated mechatronics with portability of machines tools having white goods product size, while offering a step-change in process productivity.

3. Process Technologies

The process technologies and enabled research will include: single point diamond turning, micro milling and drilling, micro embossing, nano-imprinting, micro stamping and plasma figuring processes. Automated process tool changing, and work-piece loading and unloading significantly improve production throughput without impacting process precision.

The machine design allows for the customisation at build for these different process technologies, while retaining common control and motion systems.