

## 1.5 Variable-Power Handheld Laser Torch

**Statement:** The technology is a dynamically variable spot size laser system for bonding (welding and braiding) metal components.

**Problem addressed:** The use of lasers is extremely dangerous, even lethal, thus limiting the settings in which they can be used. Most laser systems known in the art, therefore, are completely enclosed systems primarily restricted to automated robotic operations. Completely enclosed and pre-programmed laser systems are impractical for unique manual repairs on sensitive components used in various industrial applications.

**Solution:** The new technology controls energy input to connect thin materials and thus prevent them from overheating. On the other hand, the technology provides a handheld compact device, which can be used in the field and inside tight spaces for repair.

**Technology description:** The laser system for bonding metal components includes an elongated housing containing a light entry aperture coupled to a laser beam transmission cable and a light exit aperture. A plurality of lenses contained within the housing focus a laser beam from the light entry aperture through the light exit aperture. The lenses may be dynamically adjusted to vary the spot size of the laser. A plurality of interoperable safety devices, including a manually depressible interlock switch, an internal proximity sensor, a remotely operated potentiometer, a remotely activated toggle and a power supply interlock, prevent activation of the laser and the laser system if each safety device does not provide a closed circuit. The remotely operated potentiometer also provides continuous variability in laser energy output.

**Benefits of the product:** The laser torch offers multiple benefits, including:

- Enhanced accuracy: variable lenses allow the user to adjust power in real time, depending on circumstantial welding needs.
- Increased portability and maneuverability: handheld form allows the user to braze in small or hard-to-reach places.
- Improved user safety: added sensors and emergency switches boost user safety.
- Decreased heat affected zone: the laser applies heat to a very localized working area to prevent damage to the welding surface.

**Areas of application:** Opportunities include various welding applications where real-time laser variation may be needed due to the spatial/accuracy constraints of traditional welding methods:

- Engine repair.
- Marine vessels.
- Heat exchanger and pressure vessel repair.
- Medical hardware manufacturing.
- Plastic mold and die restoration.
- Jewelry manufacturing and repair.
- Eyeglass frame welding.