SmileyNova Laser Marking System Operation Manual

1. Safety Precautions

1.1 Laser Safety
- Wear laser safety goggles during operation to avoid direct exposure to the laser beam.
- Ensure the equipment enclosure is closed during operation to prevent laser leakage.

1.2 Environmental Requirements
- Maintain proper ventilation and avoid dusty, humid, or high-temperature environments.
- Keep away from flammable or explosive materials.
- Use a fume extractor to collect and filter smoke during operation.

1.3 Emergency Operations
- Press the emergency stop button immediately in case of emergencies and disconnect the power supply.

2. Equipment Components

2.1 Fiber Laser
- Power: 20W
- Laser Wavelength: 1060nm
- Beam Quality: <1.2 (M^2)
- Laser Type: Pulsed
- Service Life: ≥100,000 hours
- Cooling: Air-cooled
- Power Supply: 220V 50Hz AC
- Operating Environment: 20°C–26°C, relative humidity <60%

2.2 High-Speed Scanning Galvanometer
- Marking Speed: ≤70,000 mm/s
- Marking Area: 110mm × 110mm
- Minimum Line Width: 0.012mm
- Repeat Accuracy: ±0.002mm

2.3 Z-Axis Control System
- Stepper Motor: TST42-48P
- Timing Pulley: XL15/82XL-10mm

2.4 Model Acquisition
- Code Reader: MV-ID2013EP

2.5 Industrial Computer

- Touchscreen All-in-One PC

2.6 Automatic Marking Software

- Windows-based software is specifically developed for clear aligner marking. It supports text and graphics marking at specified locations.

3. Operation Procedures

3.1 Startup Preparation

- Connect the power supply and turn on the main switch.
- Start the fume extractor (provided by the user).
- Launch the BSL Laser Control Software and Auto Laser Marking (ALM) software sequentially.

3.2 File Setup

- Copy the data files required for the aligner workpiece (e.g. the .txt files exported from the SmileyNova treatment planning software) into the data folder specified by ALM.
- Place the aligner workpiece on the platform.
- Press the START button on the right side of the equipment.

3.3 Focal Length Calibration

- After powering on or restarting the machine, use a measuring tool to verify the focal length matches factory settings.
- If inconsistent, use the ↕confirm function in the ALM software to adjust.
- Restart and re-measure until the distance between the galvanometer and platform matches factory parameters.

3.4 Coordinate System Adjustment

- The ALM automatically identifies the coordinate system of the .txt files exported from the SmileyNova treatment planning software.
- If the coordinate system of the data file does not align with the workpiece platform, adjust the marking machine's coordinate system by rotating clockwise or counterclockwise.

3.5 Parameter Settings

- Adjust laser power (typically 70%–90%) in the BSL software based on material type.
- Set marking speed (typically 500–1500) and scanning passes (typically 3–5) as needed.

4. Maintenance

4.1 Daily Maintenance

- Clean the code reader lens and laser galvanometer lens with a lint-free cloth and anhydrous alcohol.
- Ensure cooling vents are not obstructed.

5. Troubleshooting

5.1 No Beep Feedback After Pressing START
- Cause: QR code cannot be read.
- Solution: Clean the code reader lens, or replace the model, or adjust the scanning angle, or modify backlight intensity (if applicable).

5.2 Beep Feedback but No Marking
- Cause: Data file not detected.
- Solution: Relaunch BSL and ALM software, or verify data file placement.

5.3 Poor Marking Quality
- Cause: Incorrect focal length or parameter settings.
- Solution: Recalibrate focal length and adjust parameters.

5.4 Marking Rotated by 90°
- Cause: Coordinate system misalignment.
- Solution: Adjust the coordinate system via rotation.

6. Important Reminder

- Unauthorized personnel are prohibited from disassembling the equipment.