TECHNICAL SPECIFICATION DOCUMENT FIBER LASER MARKING MACHINE FOR STEEL ANGLE IRON MARKING

1.0 SCOPE OF SUPPLY

This specification contains the technical requirements for a Fiber Laser Marking Machine for permanent marking of steel angle iron used in Transmission line structures.

The marking requirement includes but is not limited to:

- Kenya Power inscriptions (text)
- Company logos
- Serial numbers
- QR codes / Barcodes
- Date codes

The primary application is marking on 50mm × 50mm steel angle iron tower bracings.

1.1 Field Deployment Requirement

The equipment shall be suitable for both workshop and field/site deployment. It shall be portable enough to be transported to remote sites and capable of operating from a portable generator where mains power is unavailable or unreliable.

2.0 APPLICABLE STANDARDS

The equipment offered shall comply with the following standards:

- **ISO 11553-1**: Safety of machinery — Laser processing machines
- **IEC 60825-1**: Safety of laser products — Equipment classification and requirements
- **ISO 9001:2015**: Quality Management Systems (Manufacturer)
- **CE Marking** (European Conformity) or equivalent
- **FDA/CDRH** laser product safety compliance (or equivalent national regulatory approval)
- **ISO 8528** (where generator is offered as part of the package)

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Signed: 	**Signed:** 
Date: 12/10/2026	**Date:** 12/10/2026

3.0 TECHNICAL SPECIFICATIONS

The Fiber Laser Marking Machine shall meet or exceed the following minimum technical requirements:

3.1 Laser Source

Parameter	Minimum Requirement
Laser Type	Q-switched Fiber Laser
Wavelength	1064 nm
Average Output Power	30W (nominal)
Pulse Frequency Range	30–60 kHz (minimum)
Pulse Energy	≥ 0.75 mJ
Expected Laser Source Life	≥ 100,000 hours
Cooling Method	Air-cooled (no water chiller required)
Beam Quality (M^2)	≤ 1.6

3.2 Optical System

Parameter	Minimum Requirement
Marking Area (F-theta Lens)	150mm × 150mm
Lens Wavelength	1064 nm
Focal Length	210 mm (nominal)
Thread Interface	M52×1 or M85×1 (compatible with main unit)
Spot Size	≤ 41 µm
Transmittance	≥ 95% at 1064 nm
Lens Material	Optical-grade glass (K9 or equivalent) with multilayer coating

***Note**: The 150mm × 150mm lens is specified to ensure fine detail resolution for text and logos on 50mm-wide angle iron, as opposed to larger lenses that may compromise marking sharpness.*

3.3 Scanning System

Parameter	Minimum Requirement
Marking Speed	≥ 7,000 mm/s (recommended: up to 10,000 mm/s)
Repeat Positioning Accuracy	≤ ±0.1 µm
Minimum Line Width	≤ 0.01 mm
Minimum Character Height	≤ 0.15 mm

3.4 Control System

Parameter	Minimum Requirement
Control Software	**JCZ EZCAD 2.0** (or later compatible version)
Control Card	**Genuine JCZ Control Card** (FBLI-B-V4 or equivalent)
Authenticity Verification	Serial number verifiable with JCZ factory
Compatible Operating Systems	Windows 7 / 8 / 10 / 11 (32/64-bit)
Supported File Formats	AI, DXF, PLT, BMP, JPG, PNG, GIF, TGA, TIF, DST
Marking Content Support	Text, Logos, Serial Numbers, QR Codes, 1D/2D Barcodes, Date Codes
Variable Data Support	Sequential serial numbers, date/time codes, database integration
Extension Axis Control	Yes (for rotary attachment and/or motorized linear axis)

***Note**: Provide documentary evidence from the equipment manufacturer or JCZ Technology that the control card supplied is a **genuine, factory-original JCZ product**. Cloned or aftermarket control cards shall result in disqualification.*

3.5 Mechanical and Electrical Specifications

Parameter	Minimum Requirement
Power Supply	220V ± 10%, 50/60 Hz, single phase
Power Consumption	≤ 500W (excluding accessories)
Operating Temperature	5°C to 40°C
Relative Humidity	≤ 90% (non-condensing)
Machine Weight	Not more than 35kg
Focus Adjustment	Motorized Z-axis (preferred) or manual focus wheel
Red Dot Preview	Yes (for accurate positioning)

3.6 Portability and Field Deployment Requirements

The equipment shall be designed for easy transportation to and from field/site locations.

Parameter	Minimum Requirement
Physical Configuration	**Integrated / All-in-One design** (single cabinet containing laser source, controller, scanner, and power supply) OR housed in a protective rolling case/suitcase
Total Machine Weight	≤ 35 kg (for the integrated unit, excluding laptop and accessories)
Transport Features	Carry handles, rolling casters, or a dedicated rolling case suitable for site transport
Setup Time	≤ 15 minutes from arrival to first marking (by a single trained operator)

Footprint	Compact design suitable for use in a mobile workshop or field tent
Protection	Dust and moisture protection suitable for temporary field use (minimum IP54 rating for control cabinet, or provided with a protective transport cover)

3.7 Generator Compatibility Requirements

The equipment shall be capable of operating from a portable generator where mains power is unavailable or unstable.

Parameter	**Minimum Requirement**
Generator Compatibility	Machine must operate reliably from a portable generator with clean, stable output
Generator Type	Inverter generator or standard generator paired with external AVR
Generator Rating	Minimum 3 kVA for laser + laptop + accessories
Input Voltage Tolerance	Machine power supply must tolerate ±15% voltage fluctuation without damage or performance degradation
Power Conditioning	**External Automatic Voltage Regulator (AVR) / Voltage Stabilizer** to be supplied as part of the package, rated for the machine's power consumption
Surge Protection	Built-in surge/overvoltage protection for the control card and laser source
Frequency Tolerance	50/60 Hz ± 5%
Harmonic Distortion Tolerance	Must operate with generator THD up to 5% without malfunction

***Note**: The Tenderer shall provide a written confirmation from the equipment manufacturer that the machine is compatible with generator power and specify the required generator rating and power quality conditions.*

3.8 Generator Supply

The generator shall meet the following minimum requirements:

Parameter	Minimum Requirement
Type	Inverter generator or standard generator with built-in AVR
Rated Output	≥ 3 kVA
Output Voltage	220V ± 5%, single phase
Frequency	50 Hz ± 2%
Total Harmonic Distortion (THD)	≤ 5%
Fuel Type	Petrol or Diesel
Runtime	≥ 6 hours at 50% load
Portability	Integrated carry handles and wheels
Noise Level	≤ 75 dB(A) at 7m

4.0 LAPTOP

Parameters	Requirements
Processor	Intel® Core'"' i7-1165G7 (up to 4.7 GHz with Intel® Turbo Boost Technology, 12 MB L3 cache, 4 cores, 8 threads)
Processor Family	11th Generation Intel® Core'" i7 processor
Memory	16 GB DDR4-3200 MHz RAM
Storage	1 TB PC!e® NVMe™ M.2 SSD (Solid State Drive)
Operating System	Windows 11 Home 64 - Bit

Display	15.6 Inches (39.62 cm) diagonal FHD (1920 x 1080), multi-touch-enabled, JPS, edge-to-edge glass, micro-edge, Corning® Gorilla® Glass NBT"', 250 nits, 45% NTSC
Battery Operating Time	Over 12 hours
Power Supply	65 WAC power adapter
Weight	Less than 3kg
External ports	USB Type-A, USB Type-C, HDMI, AC Smart Pin, Microphone

5.0 SUPPLY REQUIREMENTS

5.1 Equipment Components

- One (1) complete Fiber Laser Marking Machine as per Section 3.0
- Standard accessories (safety glasses, foot pedal, USB drive with software, instruction manual)
- 150mm × 150mm F-theta lens (installed)
- Genuine JCZ EZCAD control card (installed and verified)
- External AVR / Voltage Stabilizer rated for the machine
- Protective transport case (if not integrated into machine design)

5.2 Inspection & Acceptance of Equipment

- System configuration for marking on 50×50mm steel angle iron
- Calibration and test marking of sample "Kenya Power" inscriptions and logos
- Demonstration of marking speed, quality, and depth
- Demonstration of generator-powered operation (using either KPLC-provided or Tenderer-provided generator)
- Demonstration of transport and setup by a single operator

5.3 Training

- On-site operator training (minimum 2 days)
- Training on EZCAD software operation
- Training on routine maintenance and troubleshooting
- Training on field deployment, generator connection, and power safety
- Training manual and documentation in English

5.4 Warranty

- Minimum warranty period: **12 months** from date of commissioning

5.5 Accessories

Item	Description	Quantity
5.1	Motorized X-axis for automatic indexing along angle iron length	1
5.2	Rotary attachment (for marking pipes/round bars)	1
5.3	Additional 150mm × 150mm F-theta lens (spare)	1
5.4	Positioning jig/fixture for 50×50mm angle iron	1
5.5	Portable inverter generator, ≥ 3 kVA, with AVR	1
5.6	Spare external AVR / Voltage Stabilizer	1

6.0 GUARANTEED TECHNICAL PARTICULARS (GTPs)

CLAUSE NO	KPLC REQUIREMENT	BIDDER'S OFFER
1.0		
1.1		
2.0		
3.0		
3.1 – 3.8		
4.0		
5.0		

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5.1 – 5.5		

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