MN-MPI-FX1000-E

MPI-FX1000

FLUORESCENT MAGNETIC PARTICLE FLAW DETECTOR

OPERATATION MANUAL

PLEASE SCAN QR CODE TO WATCH THE OPERATION VIDEO OF PRODUCTS.

VIDEO

INSIZE

NOTICE

Before operating this equipment,

please be sure to read this manual carefully

and fully understand its contents.

Table of Contents

I– Safety Warnings

1. Before operating this machine, carefully read the instruction manual, familiarize yourself with the machine's technical specifications and process requirements, thoroughly check that all wiring is intact and properly connected, and adjust the electrode spacing before starting the machine.

2. This machine should be used or stored in a clean, dry, vibration-free, non-corrosive, well-ventilated environment, without high temperatures. Recommended storage temperature: -5°C to +60°C, relative humidity ≤ 90%.

3. **Do not use low-flashpoint kerosene to prepare magnetic suspension fluid!**

4. During operation, the machine carries high currents. Workpieces and electrode plates must have good contact to prevent burning due to poor electrical contact.

5. While the machine is running, current passes directly through the workpiece. The contact surfaces of the workpiece must be free of impurities, burrs, or oxide scales. Poor contact may cause sparking, resulting in workpiece damage or accidents.

6. This machine is a semi-automatic flaw detection device. Operators must remain fully attentive during operation and must not leave the machine running unattended.

7. The machine grounding conductor must be securely connected, with a cross-sectional area no less than 20 mm².

8. The magnetic suspension fluid must be free of impurities. The storage tank should be cleaned regularly (recommended once a week), both inside and out. Magnetic suspension fluid should be filtered before filling the storage tank.

9. Because the surface of inspected workpieces is often rough and has a large surface area, spraying will remove some magnetic particle each time. Therefore, magnetic suspension fluid and

particle must be replenished regularly to ensure proper flaw detection.

10. When using water as the magnetic particle carrier, dispersants and anti-rust agents must be added according to process requirements.

11. Ultraviolet lamps should not be turned on and off frequently. After turning off, allow the lamp to cool completely (typically 15 minutes) before turning it on again.

12. The front and rear doors of the magnetizing power control cabinet must not be opened except for maintenance. Never open them during operation.

13. If the machine is stored for extended periods, inspect all internal and external cables for looseness, oxidation, breakage, or disconnection, and verify that grounding connections are intact. A trial run is required before returning to normal operation.

14. Lubricate relevant parts of the equipment before each shift.

15. Power wiring must comply with the phase sequence indicated on the machine. After power-on, check that the water pump motor rotates in the correct direction according to the arrow on the motor. If not, swap two phases. The connections between the clamping device and the power control cabinet must match in numbering.

16. The machine housing must be properly grounded during operation.

17. Periodically inspect all mechanical fasteners to prevent loosening due to prolonged operation.

18. Regularly check electrical connections for looseness to prevent arcing, damage to components, or personal injury from high current.

19. The main power must be turned off before cleaning or maintaining the machine.

20. In case of equipment failure or emergency, press the

emergency stop button immediately.

21. Operators must be trained and qualified to use this equipment. Maintenance personnel must have the required skills and qualifications.

22. Operators must be familiar with the location and operation of the emergency stop switch.

23. Electrical maintenance must comply with standard electrical safety procedures. Personnel must wear insulated shoes, and the main power switch must be monitored with warning tags during maintenance.

24. When inspecting electrical equipment, the main power may still carry voltage. Follow electrical safety procedures to ensure safe work.

25. During magnetization, the machine generates strong external magnetic fields. Remove or shield any instruments or devices that cannot operate in strong magnetic fields.

26. The power grid should be free of strong mid-frequency interference to avoid damage to electrical components and ensure normal machine operation.

II– Product Performance Description

1 Product Overview

1.1 Purpose

The MPI-FX1000 Fluorescent Magnetic Particle Inspection Machine is a horizontal semi-automatic wet-type fluorescent magnetic particle inspection system. It is designed in accordance with the technical requirements of GB/T 15822.3—2005 / ISO 9934-3:2002 Magnetic Particle Testing, and its manufacturing process complies with JB/T 8290-2001 Magnetic Particle Inspection Line standard.

The equipment is primarily used for fluorescent magnetic particle inspection of workpieces. It is capable of detecting fine surface and near-surface discontinuities caused by fatigue, quenching, forging, machining, and other manufacturing processes.

1.2 Basic Principle of Magnetic Particle Inspection

In nature, magnetic flux lines always maintain continuity. When a ferromagnetic workpiece is placed in a magnetic field that brings it to saturation, the magnetic flux lines are guided through the workpiece. If the flux lines encounter discontinuities in the material (such as cracks, inclusions, porosity, etc.), they must deviate around these defects in order to maintain continuity.

If such discontinuities are located on or near the surface, and the magnetic flux within the workpiece has reached saturation, the flux lines will bypass these regions of lower magnetic permeability (higher reluctance) and leak out of the surface, forming a so-called leakage magnetic field. Magnetic poles are thereby generated at both sides of the defect. When magnetic particles (or magnetic suspension) are applied to the surface of the magnetized workpiece, the particles are attracted to these poles, forming clearly visible linear or dot-like indications.

It must be noted that not all defects will be revealed after magnetization. If a defect is oriented parallel to the direction of the magnetic flux lines, no flux leakage will occur at the surface. Only when the magnetic flux lines intersect the defect at a certain angle or are perpendicular to its orientation can the defect be effectively indicated.

If a defect is located deeper beneath the surface, the magnetic flux lines may still bend, but may not emerge from the surface. In such cases, the leakage magnetic field will be weak, resulting in faint indications or no visible indication at all.

1.3 Equipment Working Principle

The MPI-FX1000 Fluorescent Magnetic Particle Inspection Machine is an electromechanical integrated system. It is primarily used for wet fluorescent magnetic particle inspection of the outer surface, end faces, and near-surface areas of workpieces in any direction.

The equipment mainly consists of:

Electrical control system
Power supply system
Auxiliary operation system
Spray magnetization system
Magnetic suspension circulation system
Fluorescent inspection system
Demagnetization system

For circumferential magnetization, the machine adopts the direct current magnetization method (direct current flow through the workpiece). For longitudinal magnetization, it uses an external magnetic field generated by dual coils. Composite magnetization can be applied in a single operation, enabling full-direction inspection of surface and near-surface cracks and fine defects.

The AC magnetizing current is equipped with phase-controlled current interruption, making the system suitable for both the continuous method and the residual magnetism method of magnetic particle inspection.

The control circuit utilizes Siemens programmable logic controller (PLC) products for centralized control. The system provides both manual and automatic operation modes:

In manual mode, each function of the equipment can be operated step-by-step independently.

In automatic mode, the equipment executes the internal PLC program automatically, completing a series of semi-automatic operations including loading, workpiece clamping, rotation and spraying, composite magnetization, rotation for inspection, demagnetization, etc.

The automatic program runs continuously. If immediate termination is required, pressing the reset button will stop the automatic cycle instantly and return the system to its initial state.

2 Main Technical Parameters
2.1 Circumferential Magnetizing Current:
0–1000 A (RMS), digital display, with phase-controlled current cut-off.
2.2 Longitudinal Magnetomotive Force (MMF):
0–12,000 AT (RMS), digital display, with phase-controlled current cut-off.
2.3 Power Supply:
Three-phase four-wire system, 380 V ±10%, 50 Hz.
2.4 Magnetization Methods:
Circumferential magnetization
Longitudinal magnetization
Combined circumferential and longitudinal magnetization
2.5 Duty Cycle:
≥ 40%; maximum continuous magnetization time: 3 seconds.
2.6 Magnetization Sensitivity:
A-type 15/30 test piece indications shall be clearly visible.
2.7 Control Mode:
Manual and automatic.
2.8 Cycle Time:
Inspection speed: approx. 10 seconds per part (excluding loading/unloading and inspection/observation time).
2.9 Electrode Spacing:
400 mm; right-side electrode box movable.
2.10 Electrode Movement:
Pneumatic drive.
2.11 Electrode Plate Diameter:
φ100 mm.
2.12 Workpiece Rotation Method:
Electrodes rotate synchronously by motor, 360° rotation.
2.13 Demagnetization Method:
Decaying (attenuating) demagnetization.
2.14 Demagnetization Effectiveness:
Maximum residual magnetism after demagnetization ≤ 3 Gauss (0.3 mT).
2.15 UV Intensity:
At a distance of 381 mm from the light source, UV intensity on the workpiece surface ≥ 3000 μW/cm².
2.16 Air Supply:
0.4–0.8 MPa.

2.17 Operating Environment:
Temperature: 10°C–40°C
Relative humidity: ≤ 90%

3 Description of Main Components
The MPI-FX1000 Fluorescent Magnetic Particle Inspection Machine features an integrated electromechanical structure. To optimize floor space utilization, the electrical control system and mechanical bed are combined into one unit (control cabinet on the left, main machine on the right).
The equipment is primarily used for wet magnetic particle inspection of internal surfaces, external surfaces, end faces, and near-surface areas of workpieces, detecting crack-type discontinuities in any orientation.
The system consists of the following major assemblies:

- Electrical control system
- Magnetizing power supply system
- Mechanical bed system
- Magnetizing unit
- Workpiece support and rotation mechanism
- Magnetic suspension spray and circulation system
- Fluorescent inspection (UV observation) system

Circumferential magnetization is achieved using the direct current method, while longitudinal magnetization is achieved via coil induction. The workpiece is magnetized as a whole, enabling comprehensive inspection of surface and near-surface cracks and fine discontinuities.
All AC magnetizing currents are equipped with phase-controlled current cut-off, making the system suitable for both the continuous method and residual magnetism method.
The control circuit uses a Siemens programmable logic controller (PLC) for centralized control, providing both manual and automatic operating modes.

Manual Mode: Each function can be individually operated step-by-step.

Automatic Mode: The system executes a preset PLC program.

Magnetization sequence (Automatic Mode):
Manual loading → electrode clamping → magnetic suspension spraying → combined magnetization (two-step magnetization) → 360° rotation of the workpiece on the support frame for fluorescent inspection (manual observation).

Demagnetization sequence:
Press demagnetization button → electrode clamping → circumferential and longitudinal decaying demagnetization → electrode release → manual unloading.
After completion of the automatic cycle, the system automatically returns to the initial state for the next operation. If immediate termination is required during execution, pressing the reset button will stop the program and return the system to the initial state.

3.1 Electrical Control System
The equipment is operated via a touchscreen interface, available in Chinese or English.
The control system serves as the central control unit and is installed inside the electrical cabinet. All operational functions are executed through this system.
It consists of:

- Main control panel
- Auxiliary operation panel
- Control circuit board

The main control panel is located at the front-left of the equipment and includes:

- Main power switch
- Power indicator light
- Touchscreen

- Manual/automatic selector switch
- Automatic cycle start switch
- Reset switch
- Functional control switches

Inside the electrical cabinet, the control circuit board integrates:

- Main circuit breaker
- PLC
- Dedicated thyristor trigger board
- Thyristors (SCRs)
- AC contactors
- Intermediate relays
- Protection circuit breakers
- Motor protectors

The system uses Siemens PLC series products for centralized control, supporting both manual step-by-step control and automatic programmed operation.

3.2 Magnetizing Power Supply System
The circumferential and longitudinal magnetization systems are powered by two independent power supply units.
High-power transformers convert high-voltage, low-current mains power into low-voltage, high-current output suitable for magnetic particle inspection.
Key construction features:

Transformer core made of high-permeability silicon steel laminations

Primary winding made of double glass-fiber insulated copper wire

Secondary winding made of electrolytic copper busbars

Insulated epoxy board coil framework

This design ensures safety and reliability.
Thyristor (SCR) conversion technology is used to achieve stepless and continuously adjustable magnetizing current. Voltage regulation is performed on the transformer secondary side using high-power SCRs, providing AC magnetizing output.

3.3 Mechanical Bed System

The mechanical bed system is the main structural body of the equipment and consists of:

Mechanical frame

Spray magnetization unit

Magnetic suspension collection tank

The mechanical frame is fabricated from high-quality welded steel. The magnetic suspension collection tank is made of non-magnetic stainless steel.
The central section of the bed houses the magnetic suspension collection tank for collecting, filtering, and recycling the suspension. The spray magnetization unit adopts a horizontal configuration and includes:

- Circumferential magnetization electrodes
- Longitudinal magnetization coils
- Magnetic suspension spray nozzles

The longitudinal magnetization coils are installed on both the left and right sides of the workpiece, forming a closed magnetic field for longitudinal magnetization inspection.
The spray nozzles are installed above the magnetization station and spray magnetic suspension downward onto the workpiece. Each spray line is equipped with a flow control valve to ensure full wetting without splashing. A manual spray nozzle is also provided at the operator station.

The fluorescent UV lamp system is installed above the inspection station for observation.
The main transformers for circumferential and longitudinal magnetization are installed beneath the mechanical bed. The magnetic suspension storage tank is located inside the bed structure.

3.4 Magnetic Suspension Spray and Recovery System
This system consists of:

- Storage tank
- Agitation pump
- Transfer pump
- Collection hopper
- Delivery piping
- Spray nozzles
- Filter screen

The storage tank is made of non-magnetic stainless steel to prevent magnetic particle adsorption and sedimentation.
Agitation is achieved through suspension recirculation, preventing damage to fluorescent magnetic particles.
Magnetic suspension tank capacity: 40 liters.

3.5 Fluorescent Darkroom Observation System
The system is equipped with LED UV lamps featuring:

High ultraviolet intensity

Large irradiation area

Uniform light distribution

At a distance of 381 mm from the light source, the UV intensity on the workpiece surface is ≥ 3000 μW/cm², ensuring compliance with fluorescent inspection requirements.

4 Components and Spare Parts List

4.1 Main Components List

All components and parts used in the equipment are branded products. All self-manufactured components are subject to in-house quality inspection and testing.

No.	Name	Specification / Model	Manufacturer
1	Control Cabinet	—	INSIZE
2	Air Circuit Breaker	3VT8100N 3P	Siemens
3	AC Contactor	3TF49-85A 380V	Siemens
4	AC Contactor	3RT6023-1AN20	Siemens
5	Relay	3RQ0012-0DB40 DC24V	Siemens
6	Miniature Circuit Breaker	5SY6 Series	Siemens
7	PLC	CPU-1214C	Siemens
8	Thyristor (SCR)	MTC110A/1600V Series	Semikron
9	Thyristor Trigger Board	AC Trigger Board	INSIZE
10	Fast Fuse	3NA3 830-2C 100A	Siemens
11	Current Transformer	2000/5A	Siemens
12	Current Transformer	2000/5A	Siemens
13	Main Transformer (Circumferential	1000A	INSIZE

	Magnetization)		
14	Main Transformer (Longitudinal Magnetization)	12000AT	INSIZE
15	Push Button Switch	Red/Green etc.	Siemens
16	Indicator Lamp	AD16-22D/S AC220V	Siemens
17	Pneumatic Cylinder	Various specifications	Airtac
18	Solenoid Valve	AC220V	Airtac
19	Water Pump	DB100	Grundfos

4.2 Wearing Parts List

No.	Name	Specification / Model	Remarks
1	Trigger Board	—	INSIZE
2	Contactor	3RT6023-1AN20	Siemens
3	Circuit Breaker	5SY6 Series	Siemens
4	Relay	3RQ0012-0DB40 DC24V	Siemens
5	Fuse	3NA3 830-2C 100A	People Electric

III - Operating Guide

1 Installation Preparation

1.1 Transportation

The equipment is packed in two separate crates: one for the power cabinet and one for the main inspection unit.
The packaged crates may be transported upright to the designated location using a forklift or crane.
The crates must not be inverted during handling.

1.2 Unpacking

Upon unpacking, inspect the equipment, accessories, and spare parts against the packing list to verify completeness.
Check whether any protruding parts of the machine have been damaged during transportation.

1.3 Installation

During installation, place the equipment steadily on a concrete floor and adjust it to the proper position.Before commissioning, carefully remove anti-rust oil from all exposed metal surfaces. After cleaning, apply a thin layer of machine oil to unpainted metal surfaces for protection.

Open the clamping device panel and check whether the wiring, cable ducts, and motors are damp, whether any wiring connections are loose or detached, whether any wires on the internal distribution board have fallen off, and whether any liquid supply or return pipes are loose, detached, or damaged. Any abnormalities must be handled promptly.
Open the power cabinet door and inspect internal components, printed circuit boards, and terminal blocks for moisture or looseness caused by transportation. Check for any disconnected wiring and rectify immediately if found.
Thoroughly clean the magnetic suspension storage tank (inside and outside). Prepare 40 liters of fluorescent magnetic suspension

and add it to the tank through a filter screen (it may also be added from the top of the clamping device). Replenish periodically as required.
Route the three-phase power supply and compressed air supply to the magnetic particle inspection line location. Install an appropriate main power switch and air supply shutoff valve near the equipment.

2 Control Panel and Button Functions

2.1 Control Panel Description

The control panel is divided into two sections: the main control panel and the auxiliary operation panel.
① Main Control Panel: Located on the front of the equipment control cabinet. It is equipped with the main power switch, power indicator light, touch screen, manual/automatic selector switch, automatic cycle start button, reset button, and various function switches of the equipment.
② Auxiliary Operation Panel: Installed at the front of the equipment. It is equipped with the automatic cycle start button, reset button, and various function switches of the spray magnetization system.

2.2 Button Functions

Power Switch: Main working power switch; turn clockwise to ON, counterclockwise to OFF.
“Spray” Button: In “Manual” mode, press to spray magnetic suspension.
“Manual / Auto”: “Auto” indicates automatic single-cycle operation;
“Manual” indicates each step can be operated individually.
“Demagnetize” Button: Press to perform automatic demagnetization of the workpiece.
“Start” Button: Press this button to initiate automatic single-cycle operation of the inspection line according to the preset program.
“Reset” Button: Press this button to return the inspection line to its initial state.
! Notes: When “Auto” mode is selected and the “Start” button is pressed, the equipment will execute the following program: Clamping → Rotation & Spraying → Two-step Magnetization → Rotation for Inspection.
To demagnetize the workpiece, press the “Demagnetize” button to perform demagnetization.

3 Equipment Operating Instructions

3.1 Preparation of Magnetic Suspension

① Preparation of Water-Based Magnetic Suspension
Fluorescent magnetic particle: 4–5 g/L water
Dispersant: 0.2% of total suspension weight
Rust inhibitor: 0.5% of total suspension weight
② Preparation of Oil-Based Magnetic Suspension (odorless kerosene must be used; low flash-point kerosene is strictly prohibited!)
Fluorescent magnetic particle: 3–4 g/L odorless kerosene
Dispersant: 0.2% of total suspension weight

3.2 Selection of Magnetizing Current
The circumferential magnetizing current can generally be calculated using the following formulas:
① Continuous method: I = 8D ~ 15D
② Residual method: I = 20D ~ 40D
Where:
I – Current value (A)
D – Diameter or maximum width of the test piece (mm)
Note: The above values are reference values only. The actual working current shall be determined by sensitivity test piece verification.

3.3 Trial Operation
Before formal operation, perform manual and automatic empty-cycle tests to check whether clamping, releasing, magnetic suspension spraying, and other actions operate normally.
Then install a workpiece and adjust the current to an appropriate value according to the magnetization specification to conduct a sensitivity test.
Attach an A-type 15/50 test piece to the surface of the test workpiece. Gradually increase the magnetizing current from low to high, spray magnetic suspension, and momentarily press the “Magnetize” button until the test piece indications are clearly visible (see Test Piece Example 1).
The magnetizing current value at this point is the optimal setting.

Test Piece Example

3.4 Automatic Inspection Process Flow
The factory-set process flow of the machine is:
Manual loading → Clamping → Spray & Rotation → Combined Magnetization → Observation → Release → Unloading

3.5 Manual Step-by-Step Operation Procedure
① After completing all equipment checks and confirming normal conditions, open the air supply valve and switch on the “Power” switch. The power indicator light will illuminate.
② Load the workpiece onto the loading rack. When changing workpiece types, adjust the spacing between the loading supports according to the actual workpiece dimensions.
③ Set the equipment to “Manual” mode. Step-feed the workpiece to the magnetization station and press the “Clamp” button to secure the workpiece.
④ Adjust the circumferential and longitudinal magnetizing currents to the minimum position. Press the “Magnetize” button and gradually increase the currents according to inspection requirements until reaching suitable values. The adjustment of circumferential and longitudinal currents should be made while the magnetizing current is energized.
Attach an A-type 15/50 test piece to the specimen, spray magnetic suspension, and momentarily press the “Magnetize” button. Observe the test piece indications to determine whether the magnetizing current is appropriate, whether the suspension concentration meets requirements, or whether the magnetic particle has deteriorated.
⑤ After all checks are completed, switch the “Manual/Auto” selector to the required position according to inspection needs to begin actual inspection operation.
In “Manual” inspection mode, each action must be activated by pressing the corresponding button.
In “Automatic” cycle inspection mode, press the “Work” button to initiate automatic single-cycle operation.
If an emergency stop is required during operation, press the “Reset” button. After resolving the abnormal condition, release the emergency stop and press the “Work” button again to resume operation.

IV- Common Faults and Troubleshooting

⚠ Note:
Non-professional personnel are not allowed to carry out maintenance on this machine. Maintenance personnel must carefully read this manual, become familiar with the equipment performance, understand the circuit principles, clearly identify the location of each component in the machine, and prepare the appropriate tools before performing maintenance.
Fault 1: Power indicator light does not turn on
Troubleshooting: Check whether there is a phase loss in the three-phase power supply installed on the mounting panel. If normal, check whether the indicator lamp is damaged.
Fault 2: Unstable current output
Troubleshooting: There may be strong medium-frequency interference in the power grid.
Fault 3: No indication of circumferential current
Troubleshooting:
① Check whether the circumferential magnetization switch is set to the magnetization position.
② If the circumferential ammeter shows no indication, check whether there are impurities or oxide layers at both ends of the workpiece, and remove the oxide layer by polishing.
③ Check whether the screws on the meter circuit board are loose and whether the terminals connected to the current transformer are loose or detached.
④ Check whether the relay contacts on AP1 have poor contact.
⑤ Abnormal thyristor trigger pulses may cause no current output or half-wave output, resulting in the fast-acting fuse F1 blowing.
Fault 4: No indication of longitudinal magnetizing current
Troubleshooting:
① Check whether the longitudinal magnetization switch is set to the magnetization position.
② Check whether the screws on the meter circuit board are loose and whether the terminals connected to the current transformer are loose or detached.

③ Check whether the longitudinal connection cable is loose.
④ Check whether the relay contacts on AP2 have poor contact.
⑤ Abnormal thyristor trigger pulses may cause no current output or half-wave output, resulting in the fast-acting fuse F2 blowing.
Fault 5: No indication on both meters
Troubleshooting:
① Check whether the circumferential and longitudinal magnetization switches are turned on.
② The PLC is not powered.
Fault 6: Magnetizing current at full scale and not adjustable
Troubleshooting: Strong medium-frequency interference in the power grid may cause thyristor breakdown and short circuit.
Fault 7: Abnormal noise during magnetization
Troubleshooting:
① Strong medium-frequency interference exists in the power grid.
② Transistor V10 on AP1 or AP2 is leaking.
③ Other faults on AP1 or AP2.
Fault 8: Main transformer overheating or burning out
Troubleshooting:
① Strong medium-frequency interference exists in the power grid.
② Transistor V10 on AP1 or AP2 is leaking.
③ Other faults on AP1 or AP2.
Fault 9: One function does not operate
Troubleshooting: Check whether the connection wires between the corresponding function button and the actuator are loose or damaged.
Fault 10: No operation of the entire machine
Troubleshooting:
① The PLC is not powered.
② The equipment has not been used for a long time or has been in service for more than 3 years; the internal PLC battery may be depleted or failed, causing loss of the PLC program.
Fault 11: Spraying device does not operate
Troubleshooting:
① Check whether the spray pump is operating and whether the phase sequence is reversed.
② Check whether the spray pipelines are blocked.

V Routine Maintenance

1. After each use of the equipment, switch off the magnetizing power supply. Flush the residual magnetic particle in the collecting hopper into the magnetic suspension storage tank, then disconnect the external power supply. Wipe off the magnetic suspension from the linear guide rails, and then wipe them again with an oily cloth to form a protective oil film.

2. **(Monthly)** Perform comprehensive maintenance on the equipment on a regular basis. Wipe the equipment with a neutral detergent; clean the oil tank, filters, pipelines, and spray nozzles; remove sediment and impurities; clean dust and oil stains from the hydraulic system and oil circuits to keep the equipment clean.

3. **(Every two months)** Regularly check the lubrication of mechanical transmission parts such as guide bushings, lead screws, rollers, gears, chains, and reducers. Check for loose bolts, and inspect gear backlash and chain tension, making adjustments as necessary.

4. All bearings of the equipment use lithium-based grease and should be replenished every six months.

5. **(Quarterly)** Clean dust inside the electrical control cabinet and main machine cabinet to ensure that all electrical components remain clean, dry, and in good electrical condition.

6. Regularly check the reliability of various mechanisms, such as limit switches, detection switches, connectors, etc., to ensure proper performance. Check whether fasteners are loose and address any issues in a timely manner.

7. Frequently inspect exposed wiring conduits and drag chain joints for insulation integrity. The equipment housing must be reliably grounded. Due to high humidity, ensure good indoor ventilation.

8. Only trained operators or maintenance personnel are allowed to open the protective covers. After inspection, reinstall the covers promptly to ensure personal safety and equipment safety.

VI Drawings and Technical Documentation

VII Operation Instructions

Suzhou insize Measurement Technology Co., Ltd.

Fluorescent Magnetic Particle Inspection Machine

MPI-FX1000

Address: 80 Xiangyang Road, Suzhou New District, 215009 China
Postal Code:215009
Fax:+86-512-68085081
Switch Lang.
Tel:+86-512-68086660

1. After the equipment power is switched on, the touchscreen will enter the startup interface.
Tap Enter System to access the Recipe Page (see Figure 2).

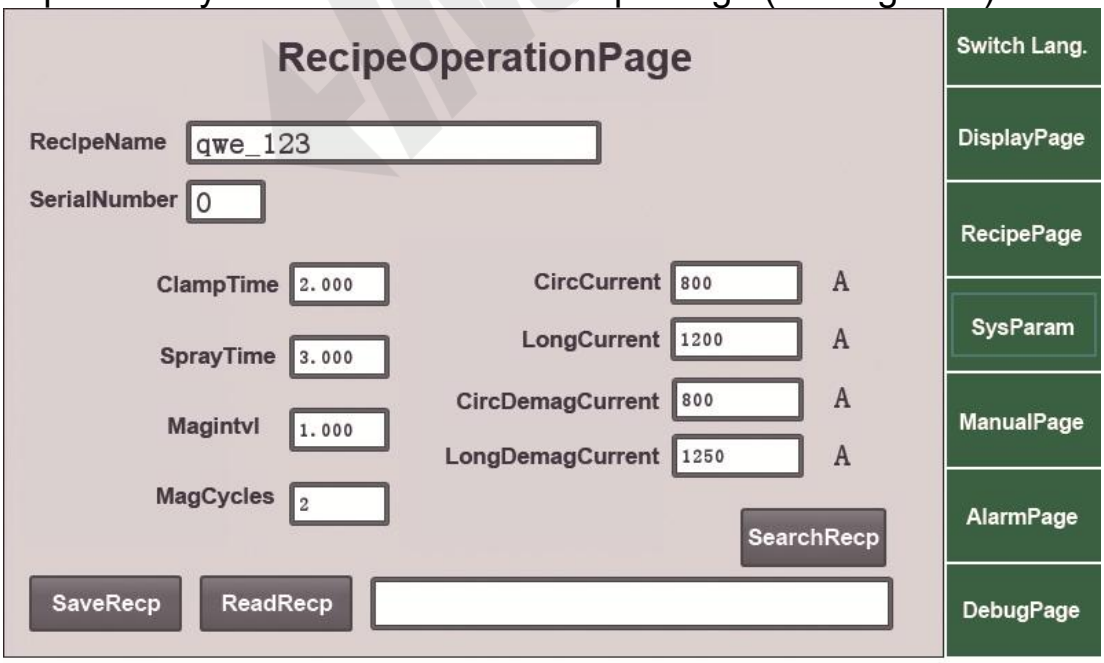
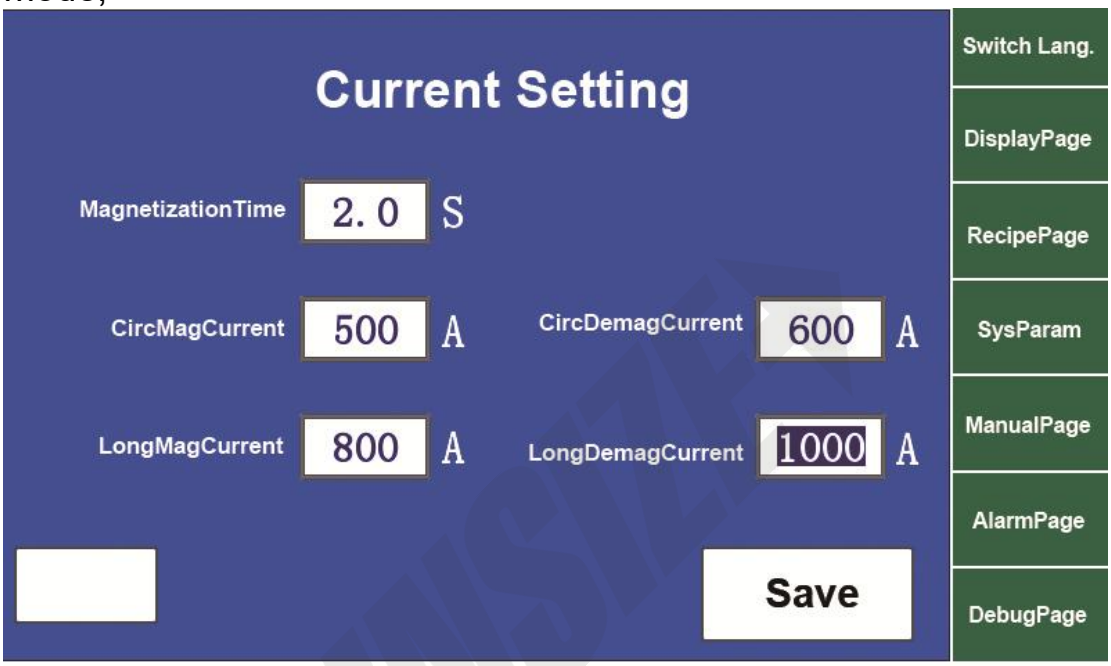
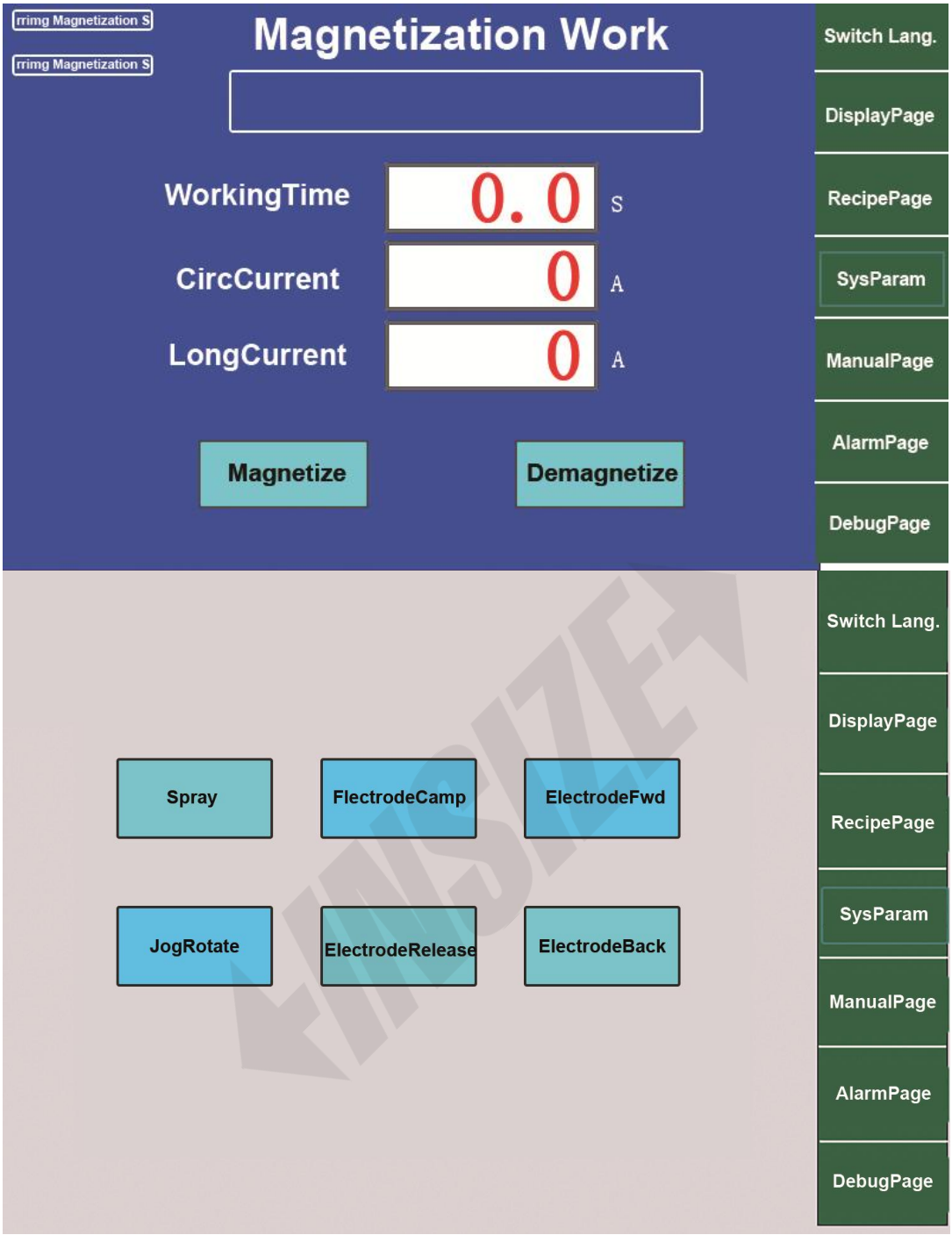


Figure 2

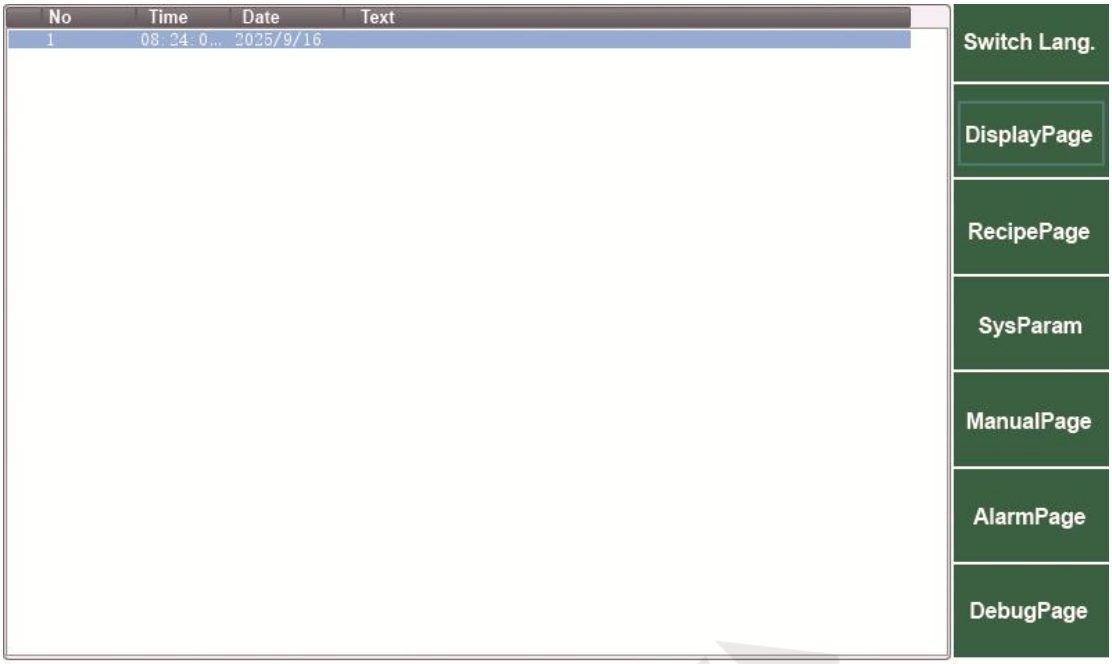
2 Create a new recipe according to the product: fill in the relevant parameters on the recipe page, as shown in Figure 2; if creating a new set of recipes, click the new serial number (0–99), select it to enter a blank recipe, fill in the new parameters, then click Write Recipe to save. To search for a recipe, enter the complete recipe name in the input box below.
Note: Writing or reading recipes must be completed under manual mode;



3 If there is a new product, click the Debug page, select the appropriate current according to the product size, click the Save button, and jump to the magnetization station page. Attach the test piece, clamp, spray, and magnetize. The test result must meet the required test piece indication effect;



4 Manual page:
Spray: Press the button to spray magnetic suspension;
Jog Rotation: Press the button, the electrode rotates; release the button, the electrode stops rotating;
Electrode Clamp: Press the button, the electrode clamps;
Electrode Release: Press the button, the electrode releases;
Electrode Forward: The right electrode box moves to the left;
Electrode Backward: The right electrode box moves to the right;



5 Alarm page:

Displays the current alarm status. Press the Reset button to cancel the alarm, and the alarm status disappears;

www.insize.com

V1