



Operation Manual

Eddy Current Sorter

ECS-5000

Introduction

The Eddy Current Sorter (ECS-5000) is an advanced metal sorting unit that is capable of separating ferrous & non-ferrous metals such as aluminium, copper, brass, alloy from dry recyclables. In all industries mix-up of metals in the form of raw, semi-finished or finished products may occur in transit, storage or at different stages at manufacturing processes and is segregated by chemical, Spectro analysis or metallurgical tests. When proper coils are selected, Eddy Current Sorter is used for segregation of ferrous and non-ferrous metals without even a scratch on job or when bulk materials having external similarity are mixed up. Eddy Current Sorter can segregate metals of all forms and conditions when proper coils are selected. This instrument is widely used for segregation of mixed-up of metals in the form of bars, pipes, tubes, rods, bolts, nuts, gears, machined components, forged parts, and various types of metal components in automobile industries, heat treatment shop, fastener industries, forging unit, metal processing unit, fertilizer, refinery, and petrochemical projects & also final inspection in quality control department.

Eddy Current Sorter is sturdy, light weight and portable test unit with an adjustable handle. Powered from single phase, 230V AC, 50 Hz source. The unit offers sine wave display. A nine (9) position rotary band switch (frequency from 10 Hz to 5000 Hz), two threshold level controls to set upper and lower limits of acceptance, a phase control to adjust the 10° to 170° phase of the sine wave. Three level indicators (Red for upper rejection, Green for acceptance and Blue for lower rejection) to indicate three different groups according to limits of acceptance set, buzzer is provided at rejection mode to alert the operator.

Working Principle

The working principle of the eddy current separator is that the eddy current magnetic field and the internal magnetic field of the eddy current separation magnetic roller are in opposite directions. Due to the repulsive force of the magnetic field, the non-ferrous metal leaps forward along its transportation direction to achieve separation from other substances and achieve the purpose of sorting.

When a metallic object is placed within or adjacent to a coil energized by alternating current, eddy currents are generated in it due to electromagnetic induction. If two metal objects having identical dimensions differ in metallurgical conditions, magnitude and phase of eddy currents generated in them will also differ. Eddy current sorter compares this difference electronically & it is projected on TFT display. Another logical circuit also compares this difference and shows an indication on LEDs. Thus, the test objects can be sorted out.

Function of Different Controls

Gain	To control and amplify trace signal
Y-Shift	To control movement of trace line
Coil Balance	To balance the signal accordance with coil balance, will not work when coils are not connected
Bridge Balance	To control unbalanced impedance
Sensitivity	To control field generation in the coils
Bridge Volt	To control amplification of bridge circuit. Area of flux density depends upon voltage induced on coils
Frequency	Selection of appropriate frequency of the signal depending upon the Metallurgical and Physical properties of the Test Piece. Frequency may be selected in 9 different steps -(10, 20, 50, 100, 200, 500, 1000, 2000 & 5000) Hz
Phase	To adjust the phase angle of the signal within the range from 10° to 170°
THRESHOLD I Up/Dn	To control upper threshold
THRESHOLD II Up/Dn	To control lower threshold
F Adjust	To adjust display frequency

Indicators

TFT Display	To display the traces according to test finding
Red LED (Rejection-R)	To indicate dissimilarity beyond to upper limit of acceptance
Green LED (Accept-G)	To indicate balancing of both coils with or without job inside.
Blue LED (Rejection-B)	To indicate dissimilarity beyond to lower limit of acceptance

Attachment of Coils

A pair of identical coils according to job is essentially required and that to be properly set with the equipment. Since coils plays an important role in sorting of materials, we suggest to select coils strictly according to size and shape of the jobs under sorting. Try to keep as minimum gap as possible between outer surface of the job and inner surface of the coil in order to achieve the highest test sensitivity.

Standard Samples for Self-Calibration

At least four known samples will require for calibration of the unit. Among these, two must be of identical size having same chemical and physical properties within acceptable criteria. Other two samples should be of same size but beyond acceptable limit; one rejected on upper side and the other on lower side.

Power Supply

This equipment is operated from 230 Volts, Single Phase, 50 Hz AC source. Connect the 3-pin socket power chord to the back side of the instrument cables 'AC MAINS' 3 pin socket. Other end of the Cable is to be connected to 230 Volts, Single Phase, 50 Hz AC source with proper earthing.

Setup Procedure

Step 1: Connect the power cord to the power socket provided at the rear panel.

Step 2: Connect the reference and test coils to the receptacle provided at the rear panel.

Step 3: Turn on the machine's power switch, which is located beneath the power outlet on the back. The TFT display will light up. Trace line (white) and threshold lines (red and blue) will show up on the TFT screen. The trace line may first show as a curving line. One of the indicator lights, Rej-R/Acc-G/Rej-B, will also glow according on how the traces look.

Step 4: For first calibration, the equipment must now be set without jobs being inserted into the coils. Using bridge balance & coil balance knobs simultaneously, move the trace line (White) to the intermediate position between the two threshold lines until the accept indicator (Acc-G) flashes. It is necessary to set the Y-Shift control knob additionally if the accept indicator(Acc-G) illuminates, but the trace line is not in the middle position.

Step 5: Turn on the "Audio" feature found on the back panel to hear a warning sound in the event of rejection.

Step 6: Consider two identical, well-known, acceptable jobs that will be used for sorting. Place one of them in the reference coil and the other in the test coil, both of which should be inserted into the coils in the same location.

Step 7: For ferrous materials, turn the frequency knob initially at step four (4).

Step 8: Adjust the bridge volt, sensitivity, and gain knobs to the midrange.

Step 9: To have the trace (White) set as a straight line between the threshold lines (Red & Blue), adjust the coil balance and bridge balance knobs concurrently. Additionally, in certain types of works, adjusting the display frequency switch could be necessary to get a straight trace line.

Step 10: Using the up and down push buttons, respectively, adjust the upper and lower Thresholds in accordance with the acceptability range. The Acc-G indication lamp will illuminate at this position.

Step 11: Place a known unacceptable job of the same size in the test coil and extract the acceptable sample from it while leaving the sample in the reference coil intact. Once the trace line crosses a threshold limit, rejection will be indicated by either a red or blue glow.

Step 12: Increase the set values of the three knobs listed in step 8 in various combinations until the intended rejection limit is reached if the rejection is not reflected.

Step 13: To complete the equipment calibration, swap out the unacceptable sample for the prior acceptable sample in the test coil. This will cause the trace line to revert to its acceptable mode, as seen in step 10. If distortion is observed, you should slightly re-adjust the two knobs as described in step 9 until you are satisfied.

Step 14: After the calibration is finished, sort the tasks, and place each one in the test coil at the same location as the samples were used in the calibration.

Cautions

- The equipment must be kept on wooden table, and ferromagnetic objects should not be placed near the equipment or coils.
- It's very advised to use UPS for steady Voltage.
- To obtain better results, it is advised to calibrate the equipment again after long-term sorting.
- Don't connect, remove or interchange coils while machine is ON.

Technical Specification

Input Supply	Single Phase, 230V AC, 50 Hz, 5Amps AC
Power Consumption	40 Watts (approx.)
Dimension (L X W X H)	350 mm x 370 mm x 177 mm
TFT Screen Size	3.5 inch
Test Frequency	10 Hz to 5000 Hz in nine steps
Phase Control	To adjust sine wave at 10° to 170°
Threshold I & II	To control upper limit & lower limit respectively
Bridge Volt	To control amplification of bridge circuit
Coil Balance	To balance the coil impedance
Bridge Balance	To regulating bridge voltage
Gain Control	Low to high gain amplification for test sensitivity

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