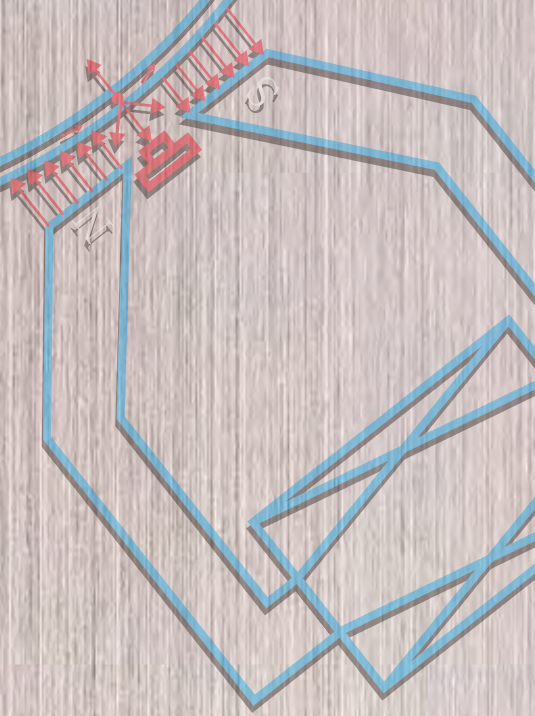
NIRECO

High-sensitivity detection of small defects in cold-roller steel plate

Surface scanning system for cold-rolled steel plate



This scanning system uses a magnetic flux leakage tester to inspect cold-rolled steel plate for minute defects with high sensitivity. It operates in gouge mode or inclusion mode, depending on the application intended for the cold-rolled steel plate.

It also detects chatter marks caused by roller vibration and other problems.

The sensor hole element, installed in a special environment, is capable of detection at high levels of sensitivity and with no saturation.

Sensor sensitivity

In inclusion mode (lift off 1mm) : A thru hole of 0.1mm diameter is detected in 0.2mm thickness steel plate with an S/N ratio of at least 12.

In gouge mode (lift off 3mm) : A thru hole of 0.3mm diameter is detected in 0.2mm thickness steel plate with an S/N ratio of at least 4.

Scanner target materials: Standard specification

1. Plate thickness: 0.1~2.0mm
2. Plate width: Depending on line specification
3. Cold-rolled steel plate, surface treated steel plate

Line specification

Line speed: 50~900mpm ... Range of use of the scanner

Features

The system has automatic and manual operation modes. In automatic mode, the steel type, plate thickness and other setting data from the host computer are used to measure relative to weld points under measurement conditions appropriate to the subject material.

During measurement, the state of the coil is displayed on the control board screen as a 2D bar graph (instantaneous values) or a 3D graph (continuous display, updated continuously). Scan records are stored in the system for a set time (approximately 6 months), or scanning data for a specified coil can be saved and displayed as a map by a screen operation, when necessary.

Scan records are collated in units of one coil or 100m and sent to the host computer.

In manual mode, measurement can start at any time, and any desired measurement conditions can be entered directly from the screen. The scanning system is equipped with an automatic calibration function, so the sensor can be moved to the calibration position for automatic calibration, which tunes the sensitivity of all sensor elements to the standard level.

Explanation of sensor working principles

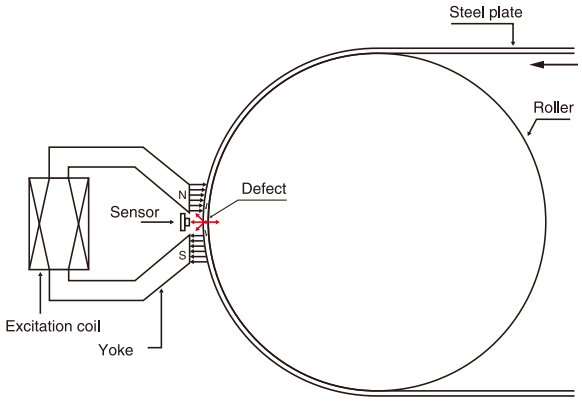
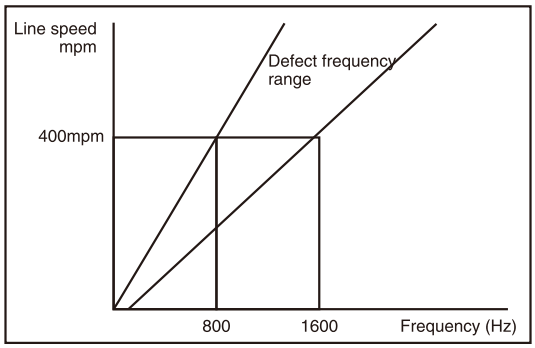


Diagram of working principles

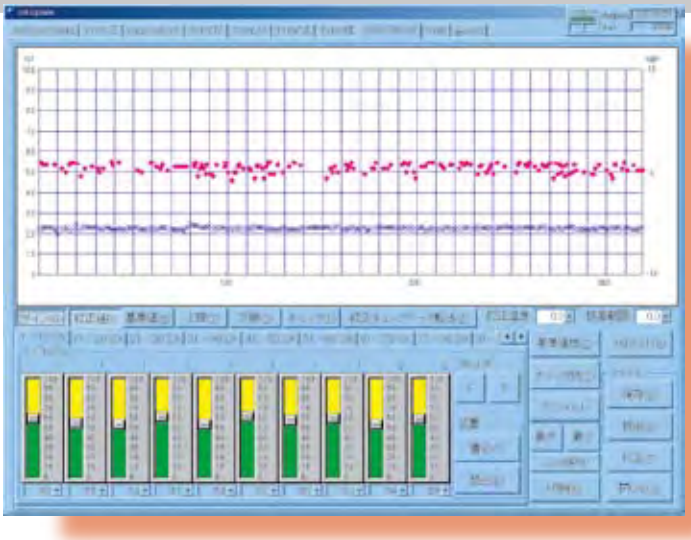


The above graph is an example of a band path filter constant.
The line speed is 400mpm, the high pass frequency is 800Hz, the low pass frequency is 1,600Hz. If the line speed increases, both the high pass frequency and the low pass frequency increase, and vice versa.

Depending on the plate thickness, the regulation DC current in the excitation coil, exciting the yoke. Flux passes from N to S, through the plate. If there is a defect, the flux is disturbed by the defect, and some flux leaks out. The quantity of leaking flux is proportional to the size of the defect.

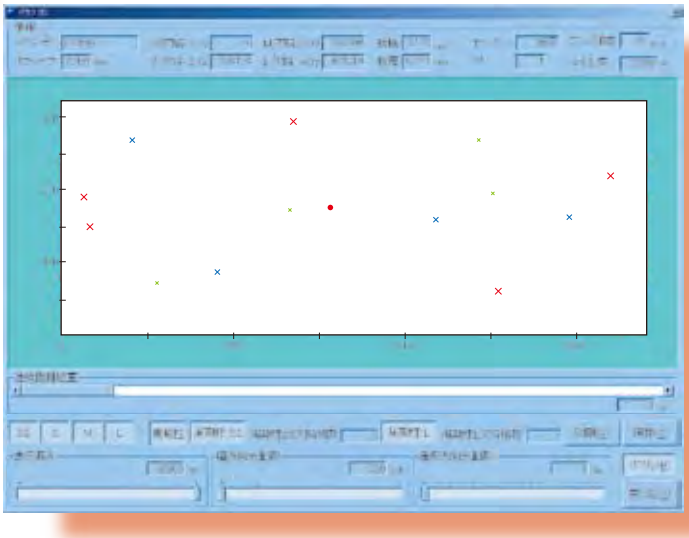
A voltage is output that is proportional to the quantity of flux moving perpendicularly to the sensor. The pre-amp amplifies only the change in that flux quantity and sends it to the damage sensor circuit board.

The defect detecting board uses a digital filter (band path) to extract the damage frequency range signal, in order to detect defects. The defect frequency changes with the speed of the steel plate, so the band path range of the digital filter varies automatically to follow the line speed.



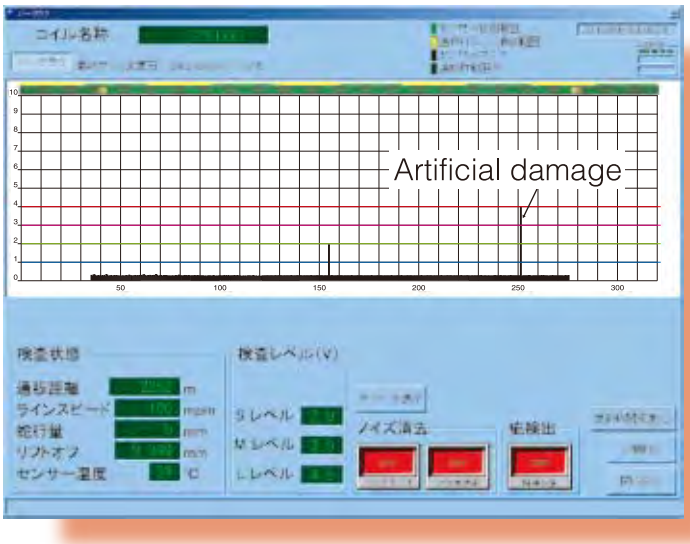
←Gain control screen

Use this screen to check, set, and select the sensor gain.
Up to ten different settings for correction gain can be stored; accordingly, select the most suitable setting for the type of steel being used.
Selection operations are carried out on-screen.



Graph 2D screen→

The coil defect data selected from the coil data screen is displayed as a two-dimensional image.



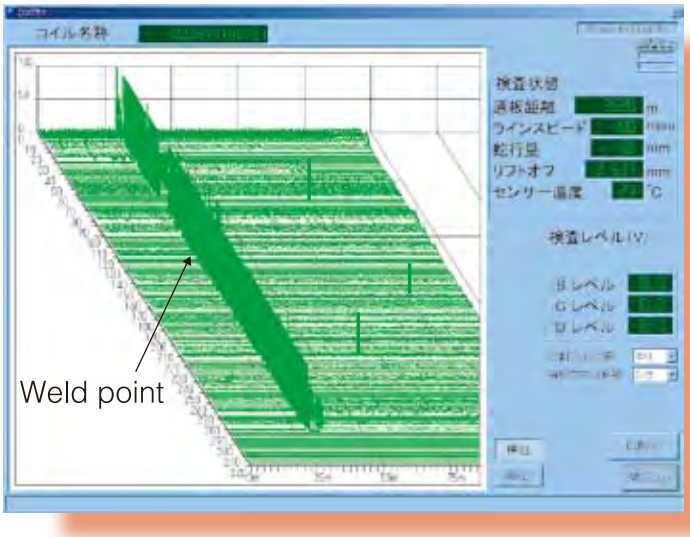
←2D bar graph screen (online)

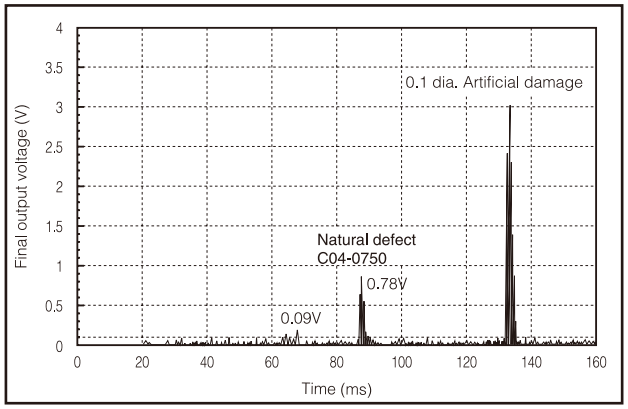
The output level of the sensor currently scanning is displayed and monitored using a 2D bar graph.
Scanning Conditions

Distance along plate	: The distance along the plate from the weld position is displayed.
Line speed	: The current line speed is displayed.
Meander	: The current amount of meandering is displayed.
Liftoff	: The current lift value is displayed.
Sensor temperature	: The current sensor temperature is displayed.

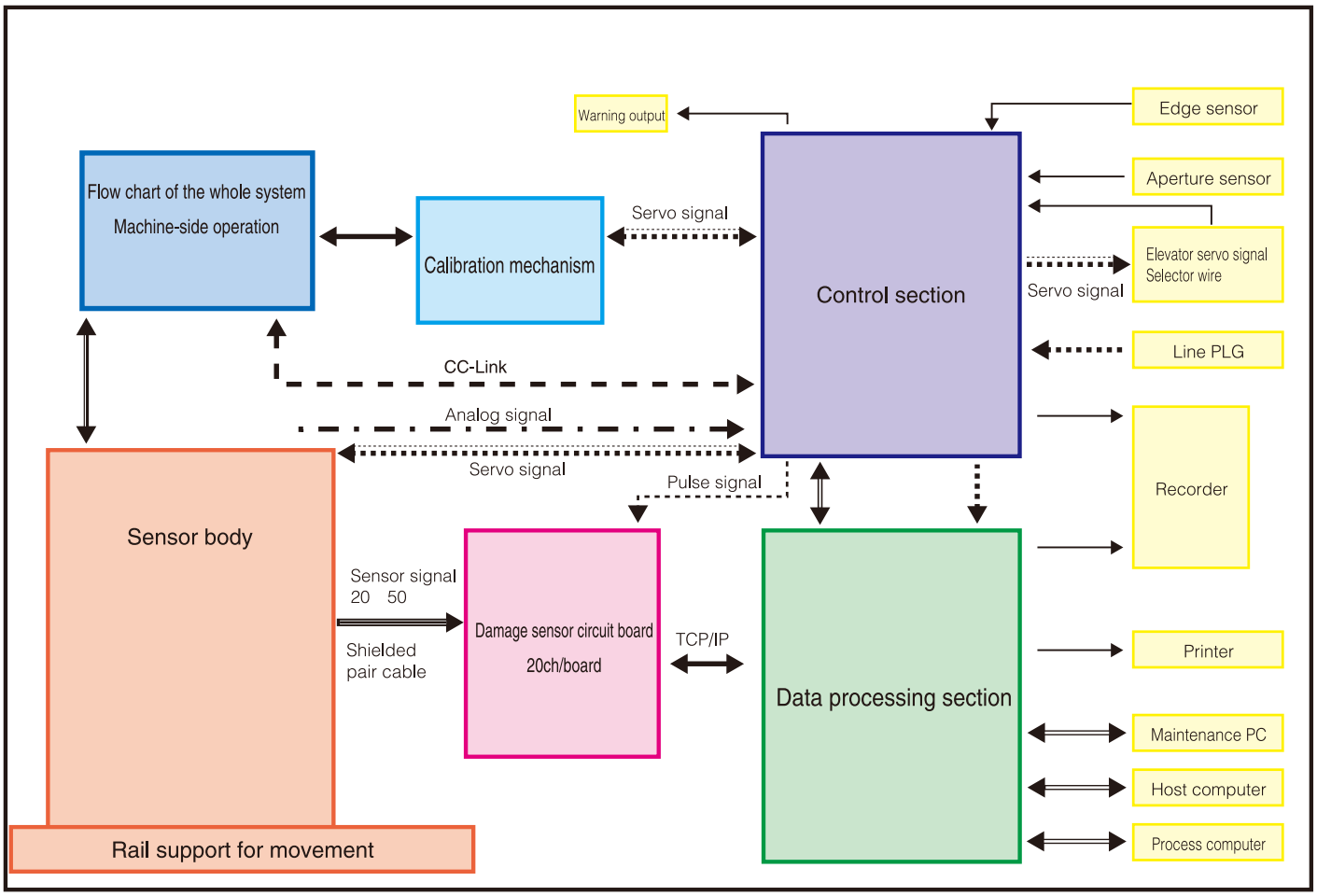
3D graph screen online →

The output level of the sensor currently scanning is displayed and monitored as a 3D bar graph.





Scan screen 20 C04-0750



NIRECO

NIRECO CORPORATION

- **Kyobashi Office**
  Kyobashi 1-chome, Building, 1-13-1, Kyobashi, Chuo-ku, Tokyo, 104-0031 Japan
  Telephone:+81-3-3562-2201 Facsimile:+81-3-3564-4316
- **Hachioji Office**
  2951-4, Ishikawa-machi, Hachioji, Tokyo, 192 Japan
  Telephone:+81-426-60-7409 Facsimile:+81-426-45-7737

Website:www.nireco-web.com E-mail:info-process@nireco-web.com

Inquiries

QI0353.0-E

May 2004 Printed in Japan