

Checking can-making machines with a Fluke ScopeMeter® 123

Application Note

The Fluke ScopeMeter 123 is the ideal instrument for adjusting and checking Krupp CAN-O-MAT® can-making and CUT-O-MAT® slitter machines during manufacture and during installation and maintenance at customer sites. In a single hand-held instrument it combines all the functions needed to provide the required signal information, eliminating the need for multimeters and relatively complex and delicate instruments such as oscilloscopes that would normally be needed in these applications.

Compact can-making machine

Krupp's CAN-O-MAT® system is the world's most compact and highest-performing automatic can-making machine. These units are built to customer specification and consist of several stations for parting, necking, flanging, beading and seaming operations. The number of stations included in the system depends on the specific application for which it is built. All stations are mechanically coupled to the main drive shaft which is powered by an electric motor with an adjustable-speed drive.

The CUT-O-MAT® is an accurate, high-speed slitter system that covers the entire spectrum of sheet, strip and blank sizes commonly used in the packaging industry. Continuous throughput at up to 50 sheets per minute guarantees high output – with 5 strips per sheet it is possible to produce 1800 blanks per minute.

Like many of today's industrial machines, Krupp's systems make extensive use of electronic control.

Several sensors are used to monitor the system status and the cans it is producing. A PLC (Programmable Logic Controller) is used to control the can-making machine. The first important sensor monitors the rotational speed of the main shaft driving the machine, and another sensor checks whether a can is present for mounting the base of the can. These present maintenance technicians with the problem of making and interpreting electronic measurements; a task for which they would normally have to use relatively complex and delicate instruments like oscilloscopes to give them the required signal information.

Measurement requirements are:

1. Test pulse width and duty cycle on the main shaft sensor of the CAN-O-MAT® to check that the signals for the can inspection occur during the cycle time of the PLC.
2. Test the 'can present' sensor pulse width of the CAN-O-MAT®. The pulse width must be at least 10 ms to ensure that it is



detected by the PLC, so that no cans can pass through the system undetected.

3. Check the 'can present' sensor phase shift relative to the main shaft sensor of the CUT-O-MAT®. This 'can present' signal should lag the main shaft signal by 270°. The pulse width must be at least 10 ms to ensure that it is detected by the PLC, so that no cans can pass through the system undetected.

Measurement 1

Test pulse width and duty cycle on the main shaft sensor of the CAN-O-MAT® to check that the signals for the can inspection occur during the cycle time of the PLC

This measurement is easy to perform with the Fluke Industrial ScopeMeter® 123.

The probe is connected to the sensor output signal and the instrument's "Connect-and-View" capability adjusts the settings virtually instantly to match the input signal and give a meaningful display of the signal's waveform. The desired measurements can then be selected directly from the ScopeMeter® 123's Measure menu, and the readings are shown in large digits on the top line of the bright, easily legible display.

Figure 1 shows the range of measurements that can be selected directly from the Measure menu, while Figure 2 shows the combined displays of waveform and numeric values for the duty cycle and pulse-width measurements.

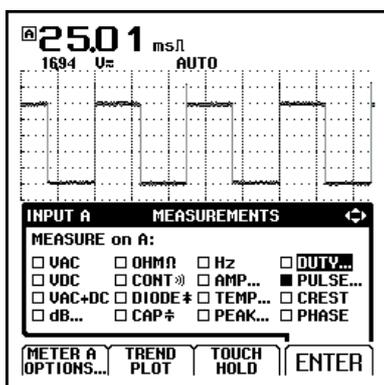


Figure 1: The required measurements can be selected instantly from the Measure menu.

Signal irregularities shown at a glance

This unique combination of oscilloscope and digital meter readings on the same display gives the operator the numeric values that are usually needed, together with a

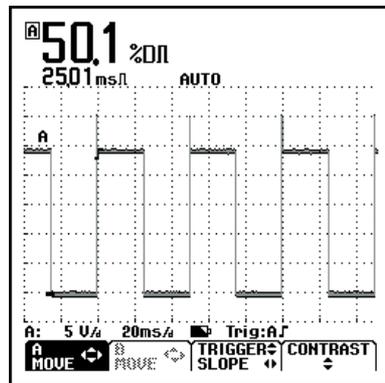


Figure 2: Combined displays of waveform and numeric values for duty cycle and pulse-width measurements.

waveform display that promotes confidence in what is being measured and allows irregularities to be seen at a glance. For example, the waveform display instantly reveals problems like ringing, noise or signal instability.

The Industrial ScopeMeter® 123's unique sampling system – through which the analog signal waveforms are converted into digital form for display and measurement in the instrument – maintains high sampling speed at low timebase settings.

This ensures that spikes which could otherwise go unnoticed are always captured and displayed.

Measurement 2

Test the 'can present' sensor pulse width of the CAN-O-MAT®. The pulse width must be at least 10 ms to ensure that it is detected by the PLC, so that no cans can pass through the system undetected.

This 'can present' signal should lag the main shaft signal by 270°. Thanks to its two input channels, the ScopeMeter® 123 can make this measurement just as easily as a standard single-channel measurement. All that is necessary is to connect the second signal to input B and select phase measurement. The Connect and

View feature then automatically tracks the signal changes so no additional operator action is needed to check the phase shift over the entire working range of the machine. Figure 3 shows the simultaneously displayed signals from the 'can present' and main shaft sensors, allowing the phase shift to be seen at a glance.

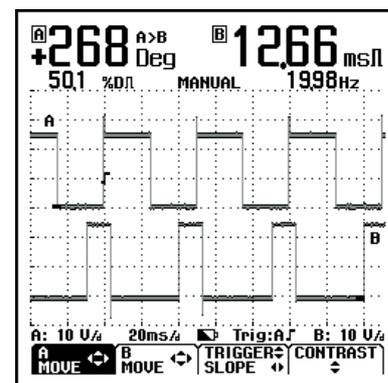


Figure 3: Phase shift can be seen at a glance from the simultaneous display of signals from the 'can present' and main shaft sensors.

Measurement 3

Check the 'can present' sensor phase shift relative to the main shaft sensor of the CUT-O-MAT®. This 'can present' signal should lag the main shaft signal by 270°. The pulse width must be at least 10 ms to ensure that it is detected by the PLC, so that no cans can pass through the system undetected.

The timing of the CUT-O-MAT® is controlled by a PLC that operates an adjustable-speed motor drive using inductive sensors to measure the speed of the system. These sensors are located on one of the gearwheels in the system's drive train. One sensor monitors the shaft speed while another monitors the passing of each of the gearwheel's 36 teeth. For correct detection by the PLC, the minimum pulse width at the highest speed of the machine must be 10 ms, and the rising edge of the shaft sensor pulse must be

located in the center of the low part, between the falling and rising edges of the gearwheel sensor.

Figure 4 shows the signal from the shaft sensor connected to input A of the ScopeMeter® 123. Displayed are the positive pulse width and the peak-to-peak voltage, together with the pulses from the gearwheel sensor connected to input B.

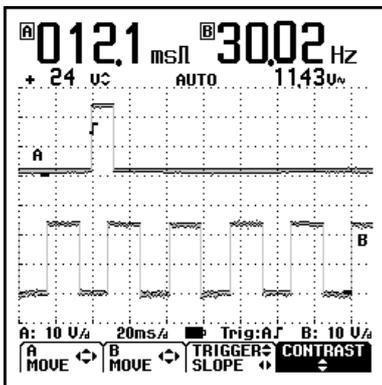


Figure 4: Positive pulse width and the peak-to-peak voltage, together with the frequency (Hz) of the pulses from the gearwheel.

At the highest speed of 50 sheets per minute, the gearwheel sensor shows $36 \text{ teeth} \times 50 = 1800$ pulses per minute, which equals $1800 / 60 = 30 \text{ Hz}$.

Conclusion

Krupp selected Fluke’s ScopeMeter 123 because the company’s technicians work within a complex and diverse environment where a multifunctional test and measurement tool is needed. Thanks to the instrument’s unique “Connect-and-View™” function, there is no need for the usual complex and time-consuming set-up and adjustment procedures. Krupp’s technicians particularly like the fact that the ScopeMeter 123 combines a scope, meter and recorder in one compact, lightweight package, and they trust Fluke’s reputation for quality and reliability.”

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up and running.*

Fluke Corporation

PO Box 9090, Everett, WA USA 98206

Fluke Europe B.V.

PO Box 1186, 5602 BD
Eindhoven, The Netherlands

For more information call:

In the U.S.A. (800) 443-5853 or

Fax (425) 446-5116

In Europe/M-East/Africa (31 40) 2 675 200 or

Fax (31 40) 2 675 222

In Canada (800)-36-FLUKE or

Fax (905) 890-6866

From other countries +1 (425) 446-5500 or

Fax +1 (425) 446-5116

Web access: <http://www.fluke.com>

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