

Claim:

1. A magnetizing pulse detector that detects magnetizing pulses produced by a magnetizing coil; the magnetizing pulse detector comprising:
 - a measuring coil configured to generate a measuring pulse in response to a magnetizing pulse produced by the magnetizing coil;
 - a measuring pulse detection circuit configured to generate a detection signal based on the measuring pulse generated by the measuring coil; and
 - a duration extension circuit configured to generate an extended detection signal based on the detection signal generated by the measuring pulse detection circuit.
2. The magnetizing pulse detector of claim 1, wherein the measuring pulse detection circuit comprises a plurality of Zener diodes connected in parallel to one another and connected in parallel with the measuring coil.
3. The magnetizing pulse detector of claim 2, wherein each of the Zener diodes of the plurality of Zener diodes has a Zener voltage of 24 volts.
4. The magnetizing pulse detector of either of claims 2 or 3, wherein the measuring pulse detection circuit further comprises a rectifier diode, where the cathode of the rectifier diode is coupled to one of the positive and the negative sides of the measuring coil, and the anode of the rectifier diode is coupled to the anodes of the plurality of parallel-connected Zener diodes.
5. The magnetizing pulse detector of any of claims 2 to 4, wherein the duration extension circuit is configured to trigger only when the detection signal exceeds a pulse threshold that indicates the magnetizing pulse produced by the magnetizing coil was sufficient to successfully magnetize a specimen.
6. The magnetizing pulse detector of any of claims 2 to 5, wherein the duration extension circuit comprises a detection signal hold relay configured to hold the detection

signal until reset by a reset signal.

7. The magnetizing pulse detector of claim 6, wherein the detection signal hold relay is a solid state relay configured to trigger only when the detection signal exceeds a pulse threshold that indicates the magnetizing pulse produced by the magnetizing coil was sufficient to successfully magnetize a specimen.

8. The magnetizing pulse detector of either of claims 2 or 3, wherein the measuring pulse detection circuit further comprises a rectifier diode, where the cathode of the rectifier diode is coupled to one of the positive and the negative sides of the measuring coil, and the anode of the rectifier diode is coupled to the anodes of the plurality of parallel-connected Zener diodes;

wherein the duration extension circuit comprises a detection signal hold relay configured to hold the detection signal until reset by a reset signal, and the detection signal hold relay is a solid state relay configured to trigger only when the detection signal exceeds a pulse threshold that indicates the magnetizing pulse produced by the magnetizing coil was sufficient to successfully magnetize a specimen.

9. The magnetizing pulse detector of any preceding claim, wherein the measuring coil is enclosed in a first housing, and the measuring pulse detection and duration extension circuits are enclosed in a second housing.

10. The magnetizing pulse detector of claim 1, wherein the measuring pulse detection circuit comprises:

a first measuring pulse smoothing portion configured to smooth oscillations in the measuring pulse;

a second measuring pulse smoothing portion configured to smooth oscillations in the measuring pulse;

a steering portion configured to direct a negative polarity measuring pulse to the first measuring pulse smoothing portion, and to direct a positive polarity measuring pulse to the second measuring pulse smoothing portion;

wherein the first measuring pulse smoothing portion generates a negative polarity detection signal when the negative polarity measuring pulse is directed to the first measuring pulse smoothing portion, and the second measuring pulse smoothing portion generates a positive polarity detection signal when the positive polarity measuring pulse is directed to the second measuring pulse smoothing portion.

11. The magnetizing pulse detector of claim 10, wherein the steering portion comprises first and second rectifier diodes;

wherein the cathode of the first rectifier diode is connected to a positive side of the measuring coil to pass a negative polarity measuring pulse to the first measuring pulse smoothing portion and to block a positive polarity measuring pulse; and

wherein the cathode of the second rectifier diode is connected to a negative side of the measuring coil to pass a positive polarity measuring pulse to the second measuring pulse smoothing portion and to block a negative polarity measuring pulse.

12. The magnetizing pulse detector of claim 11, wherein the first measuring pulse smoothing portion comprises a first plurality of Zener diodes connected in parallel, and the second measuring pulse smoothing portion comprises a second plurality of Zener diodes connected in parallel; and

wherein the anode of the first rectifier diode is connected to the anodes of the first plurality of Zener diodes, and the anode of the second rectifier diode is connected to the anodes of the second plurality of Zener diodes.

13. The magnetizing pulse detector of either of claims 11 or 12, wherein the measuring coil is enclosed in a first housing, the measuring pulse detection and duration extension circuits are enclosed in a second housing, and an interconnect cable connects the first and second housings; the interconnect cable comprising:

a first line configured to couple the positive side of the measuring coil to the cathode of the first rectifier diode;

a second line configured to couple the negative side of the measuring coil to the cathode of the second rectifier diode; and

a cable screen configured to couple to safety earth.

14. The magnetizing pulse detector of any of claims 10 to 13, wherein the duration extension circuit comprises:

a negative pulse detection circuit configured to trigger based on the negative polarity detection signal; and

a positive pulse detection circuit configured to trigger based on the positive polarity detection signal.

15. The magnetizing pulse detector of claim 14, wherein the negative pulse detection circuit is configured to trigger only when the negative polarity detection signal exceeds a negative pulse threshold that indicates the magnetizing pulse produced by the magnetizing coil was sufficient to successfully magnetize a specimen with negative polarity; and

the positive pulse detection circuit is configured to trigger only when the positive polarity detection signal exceeds a positive pulse threshold that indicates the magnetizing pulse produced by the magnetizing coil was sufficient to successfully magnetize the specimen with positive polarity.

16. The magnetizing pulse detector of claim 15, wherein the negative pulse detection circuit comprises a negative pulse detection hold relay configured to hold the extended detection signal until reset by a reset signal; and wherein the positive pulse detection circuit comprises a positive pulse detection hold relay configured to hold the extended detection signal until reset by the reset signal.

17. The magnetizing pulse detector of claim 16, wherein the negative pulse detection hold relay is a solid state relay; and the positive pulse detection hold relay is a solid state relay.

18. The magnetizing pulse detector of either of claims 16 or 17, wherein the negative pulse detection hold relay is configured to trigger only when the negative polarity

detection signal exceeds a negative pulse threshold that indicates the magnetizing pulse produced by the magnetizing coil was sufficient to successfully magnetize a specimen with negative polarity; and

the positive pulse detection hold relay is configured to trigger only when the positive polarity detection signal exceeds a positive pulse threshold that indicates the magnetizing pulse produced by the magnetizing coil was sufficient to successfully magnetize the specimen with positive polarity.

19. The magnetizing pulse detector of any of claims 16 to 18, wherein the reset signal is generated external to the duration extension circuit.

20. The magnetizing pulse detector of any of claims 10 to 12, wherein the measuring coil is enclosed in a first housing, and the measuring pulse detection and duration extension circuits are enclosed in a second housing.