

Western Instruments

Established 1965

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Operating Instructions August 2013



WP-Series

Medium Duty AC/DC Mag Coils

Western Instruments

Established 1965

WP-Series Coils are operated from either 115 VAC or 230 VAC Power, which again can be either 50 or 60 Hertz. These Coils induce a Pulsed DC Magnetic Field, at the specified power frequency, in the ferrous material being tested. WP-Series Coils may be ordered with an AC feature, which will induce an AC Magnetic Field as well. These Coils conduct electricity in a circular fashion, which induces a Longitudinal Magnetic field in a workpiece orientated axially through the Coil. This equipment should be utilized within the parameters set by the operational specifications within this guide.

Description

- 1. Coil Housing** – The Coil Housing is cast from a durable Urethane Rubber, which protects the Aluminum Wire Core. This Robust encapsulant is resistant to cracking and disbonding due to age or high/low temperatures, and is suitable for Dry or Wet Method media. Cast into the top inside portion of the Coil Housing are 2 nonferrous bars, which are used to mount the Aluminum Control Panel Housing. Standard Coil sizes are 8" (203mm), 10" (254mm), 12" (305mm) or 14" (356mm) Inside Diameter and are selected depending on the size of the Work Piece to be inspected, however their operation and maintenance are identical.
- 2. Control Panel Housing** – The Control Housing for WP-Series Coils, used to mount the Solid State Electronic Controls, is securely fastened to the molded coil housing with custom internal aluminum fasteners. The Housing is of a Welded Aluminum Construction, and fitted with a Handle which also protects the Control Actuators from mechanical damage. Mounted to the Control Panel Housing is the anodized aluminum Control Panel which is used for mounting the Coil's controls. The reverse (or underside) of the Panel acts as the mounting plate for all of the Control Components, while the top side is where all the operator controls are located.

The entire Control Panel Housing assembly acts as a heat sink to dissipate heat from the electrical / electronic controls which increases the duty cycle. Operators should not be alarmed when the Control Panel or Housing becomes warm to the touch. Exposure to Bath (Carrier) fluids should be minimized, as they will cause failure to seals or other components mounted to the Control Panel.

- 3. Control Options** – As stated in the literature, WP-Series Coils are available with 4 different Control Options, which are summarized below;
 - **Basic** - Models: WP-8, WP-10, WP-12. and WP-14
 - *Energize Button*. Activates Coil with 4000 Amp Turns of AC Output
 - **AC/DC** - Models: WP-8D, WP-10D, WP-12D, and WP-14D
 - *Energize Button*:. Activates Coil
 - AC/DC Switch with 4000 Amp Turns of AC and 6000 Amp Turns DC (7,000 @ 230V)
 - **Variable DC** - Models: WP-8DV, WP-10DV, WP-12DV and WP-14DV
 - *Energize Button*:. Activates Coil
 - AC Output (AC/DC Switch): 4000 Amp Turns AC
 - *Infinitely Variable* DC Output Potentiometer: 0 to 6000 Amp Turns DC (7,000 @ 230V)

- **Reversing DC** - Models: WP-8DVR, WP-10DVR, WP-12DVR, and WP-14DVR
 - *Energize Button*: Activates Coil
 - *AC Output (AC/DC Switch)*: 4000 Amp Turns AC
 - *Infinitely Variable DC Output Potentiometer*: 0 to 6000 Amp Turns DC (7,000 @ 230V)
 - *Positive / Negative Polarity Switch*: Used for Reversing DC Demagnetization



Infinitely Variable DC Adjustment

AC / DC

Positive / Negative

Energize Button

The details for each particular function for the WP-Series Controls is as follows

a) *Energize*. This Solid State Push Button Switch is a sealed design for safety. While depressed, the switch delivers a ½ Watt control signal to the electronic controls (semiconductors) sealed in the Output Module. The Output Module connected to a receptacle plug on the reverse side of the Control Panel, and supplies the necessary power to the encapsulated Coil.

If the Coil fails to turn on when the Energize button is depressed, check the following items in this order; AC Mains Power, Power Plug, Power Cord, connection of the Output Module, and lastly the switch via the internal connections, if these connections are all fine, replace the Output Module. The solid state Output Module switches the line power to the necessary control components.

b) *AC / DC*. This switch controls the power induced to the units internal Coil. When the Switch is thrown to the AC Position, the current is activated by pressing the Energize Button. The position of the switch can not be changed when the Coils is activated as it will cause control damage.

Obviously, when in the AC Position, the coil will produce an AC Field, and Pulse DC when in the DC position. Adjusting the DC Intensity Knob while the Coil is activated is completely acceptable. However, the Field Selection Switch (AC/DC) should not be touched while Coil is Energized (turned on). If the Field Selection Switch is changed

when the Coil is Energized, an overload will occur. When overloaded, the Control Printed Circuit Board will fail, resulting in a partial or complete failure to the Controls, and may trip the electrical breaker (Mains Power) the Coil is supplied from.

DO NOT CHANGE THE FIELD (AC/DC) WITH THE PUSH BUTTON DEPRESSED.

c) *Infinitely Variable*. This Control Knob allows the operator to adjust the power current going to the coil, and in turn varies the Ampere Turns the Coil induces into the workpiece. This control may not be completely linear over its 0 to 100% range and the scale, engraved on the Control Panel, is not calibrated and is only used as a reference point for the operator.

Mounted to the back side of the Control Panel, and inside Control Panel Housing, is the DC Control Board and Heat Sink. The Control Printed Circuit Board rectifies AC power to DC and directs the Pulsed DC current directly into the Coil. The DC Intensity Controls are contained on the same Printed Circuit Board, and adjusts the DC Current and thus the Amperes Turns Output of the Coil.

d) *Demag*. The Positive / Negative Control Switch or Field Polarity Switch simply reverses the direction of the current flow within the Coil. In other words, it changes which side of the Coil is either Positive or Negative. When changing the Coils Polarity (position of this switch), the Coil must not be Energized. If performing a Demagnetization, the operator should wait about a second between each reversal, to allow the field in the Coil to fully collapse.

4. Duty Cycle – The Duty Cycle (maximum duration) for periodic operation is set to avoid overheating of the Internal Aluminum Wire Coil. Warm (or hot) Coil Wires have an increased resistance, and will reduce the overall Ampere Turn output of the Coil.

WP-Series Models should not be activated, using the Energize Button (or Foot Switch) for more than 10 seconds at a time. The activation time should be followed by an equal or longer cool down (or off) cycle. This 50% duty cycle is set to protect the Wire Coil and the Control Components from overheating.

If the unit is used for extended periods of time, with short periods of activation (during Demagnetization), the operator should be mindful of the temperature of the Coil and Control housing. If the operator has any concern about the actual or planned operation of the Coil, Western Instruments or the Distributor should be consulted.

5. Field Characteristics – WP-Series Coils are classified as Pulsed DC devices and are designed to induce a Longitudinal Field in a Work Piece positioned though the Centerline of the Coil. A transverse Field may be introduced, if the Work Piece is short enough, by placing it perpendicular and inside the Coil's inside surface. WP-Series Coils are designed to comply with specifications requiring Residual or Active Fields.

AC Magnetic Fields are sensitive to surface defects due to the 'Skin Effect' as the field travels over the surface. The Inspection Media (Dry or Wet) has a tendency to migrate toward interruptions (or defects) in the field. The direction and intensity of an AC Field, by it's nature, alternates causing high particle mobility, so defects tend to be revealed immediately.

DO NOT CHANGE THE FIELD (AC/DC) WITH THE PUSH BUTTON DEPRESSED

Pulsed DC is stronger than an AC Field and tends to penetrate the work piece more deeply, however DC is still sensitive to surface defects. When testing with a DC field, inspection media tends to adhere to the entire target area of the work piece, due to the reduced particle mobility. Depending on the method employed (Wet or Dry) the operator may need to adjust the way the inspection media is put onto the workpiece. Media application at right angles to the field is beneficial. Furthermore the amount of particle placed on the surface of the workpiece may need to be adjusted. An excess may make an indication unclear and not enough media may not fully cause an indication to be made visible. The intensity of a DC Field, by its nature, is fixed but the Coil does Pulse the field providing some stimulus for the particles to migrate to defects.

6. Operation

AC Operation

An AC Field can be used during an Active Field Inspection, and will detect surface breaking defects only. The Operator should not attempt an AC Residual Field Inspection as the Coil's Output Module (Solid State Switch) is not designed to stop current flow when the sine wave crosses the zero point.

Operators may attempt to demagnetize a workpiece using an AC Field, however it will only demagnetize the surface of the part. Such a demagnetization is acceptable for very small parts, however it will only demagnetize the surface of larger parts. If a larger part is attempted to be demagnetized using an AC Field, only the surface (skin) of the workpiece will be demagnetized. Over a short period of time, the field within the workpiece, will again creep through to the surface.

The Duty Cycle of a WP-Series Coil, while in AC mode is 75%, which means the unit can be operated for extended periods of time without overheating the Core. This time should not exceed 5 minutes on, followed by a 2 ½ minute cool down cycle. However, any Coil is used in AC or DC mode, short shots are as effective than prolonged activation. The only reason to activate a Coil for more than 3 or 4 seconds at a time is to encourage particle migration, longer cycles will not increase the field induced into the workpiece.

DO NOT CHANGE THE FIELD (AC/DC) WITH THE PUSH BUTTON DEPRESSED.

Pulse DC Operation

The Coil is either placed on the Work Piece, such as a threaded end of a pipe, or if the Work Piece is small it can be held within the inside of the coil. If held and if it is short enough to be rotated within the coil, a longitudinal or transverse field can be induced into the Work Piece. Application of particles, depending on the specification and skill of the operator, are applied while the Coil is Energized (Active Field) or after the field is set-up in the Work Piece (Residual Field). Active Field Inspection requires less skill by the operator in the application of the particles. With Residual Field Inspection there is no particle migration and greater skill and care must be taken in the application of the inspection media.

Infinitely Variable

WP-Series Coils are placed over the Work Piece, setting of the Field Intensity by the operator with the Current Control Knob, and followed by energizing the coil (a "Shot") with the Push Button Energizing Switch. A positive or negative field is induced, for an Active or Residual Field Inspection. The level of the intensity is determined by; the operator,

documented procedure, or test indicators such as QQI's, Castrol Strips, or even a Pie Gauge.

Reversing Polarity (Demagnetization)

The Positive / Negative Switch is used to Demagnetize (Demag) a workpiece, by changing the polarity of the Coil. To Demagnetize the Work Piece;

1. The operator places the coil back over the work piece and reduces the Current Control Knob by approximately 20% from the magnetization current selection.
2. The operator must then reverse the field to the opposite polarity (direction) from the magnetization shot.
3. The operator then presses the Energize Button for a short duration (1 second).
4. The Current Control Knob is again reduced by approximately 20%, the field is reversed, and then the coil is again Energized for a short duration.
5. Steps 1 through 3 are repeated until the final shot at 0 amps.

Note: Contact Western Instruments for more complete Demagnetization information.



The number of Demag shots may be decreased or increased depending on; the amount of field induced during magnetization, the size (mass) of the part; or the magnetic permeability of the workpiece. 5 reversing cycles is an absolute minimum, but should rarely exceed 10 cycles. Operator experience will dictate the number of reversing cycles. While performing a Demag procedure, the operator will save time and be far more effective if a Magnetometer (W-FI) is used to check the field direction and strength after each cycle.

Demagnetization using a WP-Series Coil can only be expected to function on a workpiece magnetized by the same Coil. To Demagnetize heavy items that are saturated, a stronger Coil (WD-Series) is required. Operators should not try to be quick in the reversing of a Demag cycle, as reversing the field and energizing too quickly may result in damage to the controls.

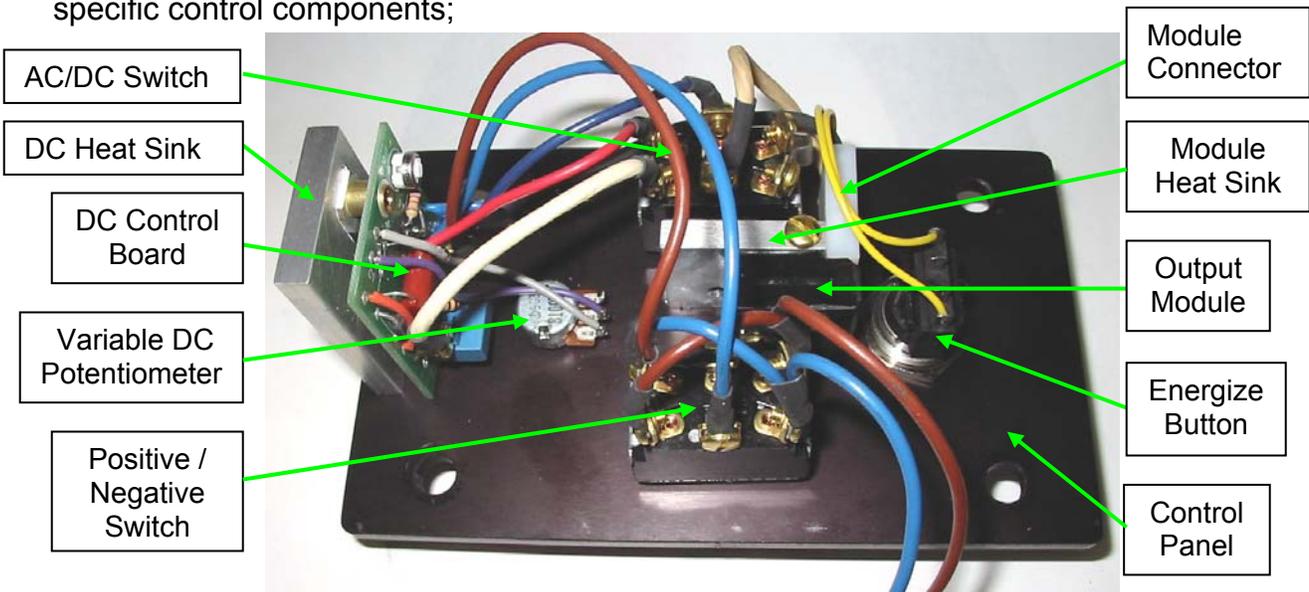
DO NOT CHANGE POLARITY (+/-) WITH THE ENERGIZE BUTTON DEPRESSED.

- 7. Maintenance:** After extended use, WP-Series Coils should be cleaned with a mild soap solution. The unit should be visually inspected regularly for any damage that could cause harm to the operator, or the material being inspected. Special attention should be paid to; the control switches/boots; the Current Control Knob; and the power cord (cable) assembly. Any potential problems to these assemblies must be reported to the distributor or Western Instruments for instructions on corrective action.

Other than routine maintenance, the operator can expect a longer service life. Depending on the Industry or in-house specification utilized, and the type of service (field or shop) the Coil should be calibrated at regular intervals (yearly). Furthermore, during calibration the field produced by the coil should be tested to ensure there is no reduction in the performance of the unit. However, the customer's Quality Manual or a Reference Specification may require more frequent Calibrations.

The distributor or Western Instruments should be contacted for any specific instructions on maintenance, due to the specific environment of operation. Repairs, that need to be carried out on the product, should be performed by a qualified service organization or Western Instruments.

Throughout this manual, various internal control parts are referred to. Below is a guide to specific control components;



Wiring

W-Series 230 Volt Models, are designated by a “K” placed after the Serial Number and the Model number (e.g. WC-6K), are shipped without an AC Power Plug as there is no international standardization. When installing an AC Power Plug onto the AWG 18-3 Power Cord, the following is the identity of the 3 Color Coded Conductors;

- Green – Ground
- White - Neutral
- Black – Live

The power outlet (Mains) shall be fully grounded, with 3 terminals, one which is a Ground (Earth). Care must be taken to insure the proper installation of an AC Power Plug, and if there is any question, contact your distributor or Western Instruments. If an AC Plug is not installed before use, any warranty is void.

Warranty: Western Instruments warrants all WP-Series Coils against defects in materials and workmanship for a period of 1 year from receipt by the end user. Consumable items are warranted against defects in materials and workmanship for 30 days from receipt by the end user. If Western Instruments receives notice of such defects during the warranty period, Western Instruments will either, at its option, repair, replace, or condemn products that prove to be defective.

Any warranty is void if the unit has been modified in any way, mistreated, or if it has been repaired by an unqualified individual or agency. The end user agrees that any equipment's disposition, when returned for warranty work, is at the full discretion of Western Instruments as to whether a claim is under warranty or due to misuse. Western Instruments warranty shall overlook normal wear, however does not include operation outside the environmental specification of the product.

Any warranty work is FOB western Instruments, and any returned units shall include a written description, by the end user, of the fault. Western Instruments makes no other warranty, either expressed or implied, with respect to this product. Western Instruments specifically disclaims

any liability arising from the use of this equipment. For the correct use of Western Instruments WP-Series Coils, refer to the Operating Instructions, furthermore we recommend formal training by qualified personnel. Western Instruments highly recommends the end user exercises all possible safety precautions, including the use of protective equipment, while operating this or other industrial equipment.

Specifications:



Model: WP-Series;

60 Hz – WP-8, WP-10, WP -12, WP-14 (D-DC Field, V-Variable, R-Reversing Polarity)

50 Hz – WP-8K, WP-10K, WP -12K, WP-14K (D-DC Field-Variable, R-Reversing Polarity).

Voltage: 115 VAC - 60 Hz (230 VAC/ 60 Hz Optional).

230 VAC - 50 Hz (Nominal).

Current: 60 Hz Models– WP-8@ 10 Amps, WP-10@ 13 Amps, WP-12@ 16Amps, WP-14@ 18 Amps

50 Hz Models – WP-8K@6 Amps, WP-10K @7 Amps, WP-12@9 Amps, WP-14K @ 11 Amps.

Capacity: 115kVAC x 60Hz

WP-8, 10, 12 14 – 4,000 Amp Turns AC.

WP-8D, 10D, 12D,14D – 0 TO 6,000 Amp Turns C, 4,000 Amp Turns AC.

WP-8DV, 10DV, 12DV, 14DV – 0 TO 6,000 Amp Turns DC & 4,000 Amp Turns AC

WP-8DVR, 10DVR, 12VDVR, 14DVR – 0 TO 6,000 Amp Turns DC & 4,000 Amp Turns AC

230VAC x 50Hz

WP-8K, 10K, 12K 14K – 4,000 Amp Turns AC.

WP-8KD, 10KD, 12KD,14KD – 0 TO 7,000 Amp Turns, 4,000 Amp Turns AC.

WP-8KDV, 10KDV, 12KDV, 14KDV – 0 TO 7,000 Amp Turns DC & 4,000 Amp Turns AC.

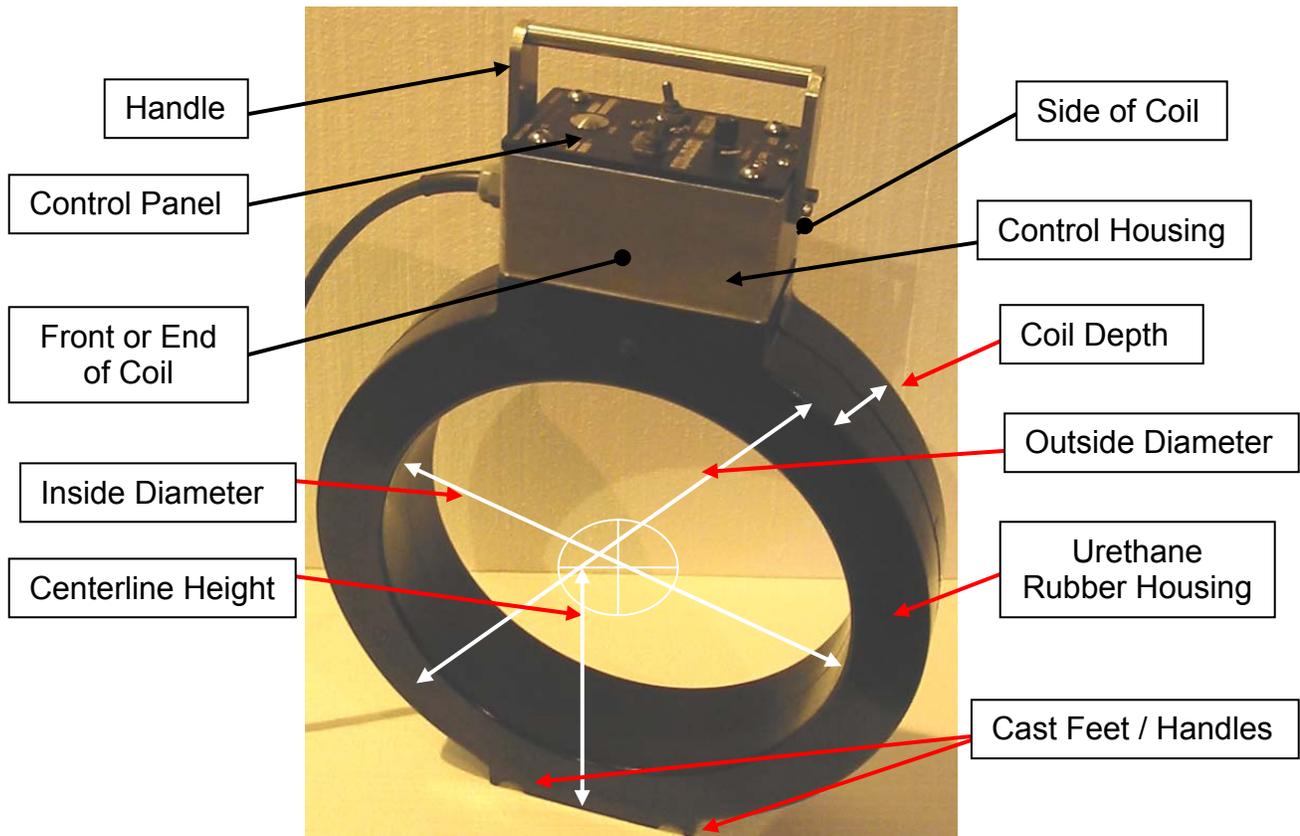
WP-8KDVR, 10KDVR, 12KDVR, 14KDVR – 0 TO 7,000 Amp Turns DC & 4,000 Amp Turns AC.

ID Size: WP-8 – 8” (203mm), WP-10 – 10” (254mm), WP-12 - 12” (305mm), 14” (356mm).

Depth: All Coils are 3 5/8” (22mm) Wide.

Weight: WP-8 - 15 pounds (6.8kg), WP-10 - 17 pounds (7.7kg), WP-12 - 19 pounds (8.6kg), WP-14 23 pounds (10.5kg).

WP-Series Coil Nomenclature



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