

# Western Instruments

Established 1965

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## Operating Instructions

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WDV-10  
Illustrated

# WD-Series

## DC Magnetizing Coils

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WD-Series Coils are operated from 115 VAC or 230 VAC Power, which is inverted and induces a DC Magnetic Field in the ferrous material being tested. As the unit conducts electricity in a circular fashion, it induces a Longitudinal Magnetic field in a Central Conductor. This device 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 7 nonferrous connecting rods, which are used to mount the Aluminum Control Panel Housing. Standard Coil sizes are 8 ½”, 10 ½”, 14” or 16” 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 Panel Housing is used to mount the Solid State Electronic Controls of all WD-Series Coils. It is designed to protect the Control Components from damage due to the riggers of field or shop use. Exposure to Bath (Carrier) fluids should be minimized, as they will cause failure to seals or other components. The reverse (or underside) of the Control panel acts as the mounting plate for all of the Control Components, while the top side is where all the operator controls are located. As indicated in promotional literature, the Variable Power Supply (WDV-Series) is equipped with adjustable amperage which is variable from 0 to 10,000 Ampere Turns output.

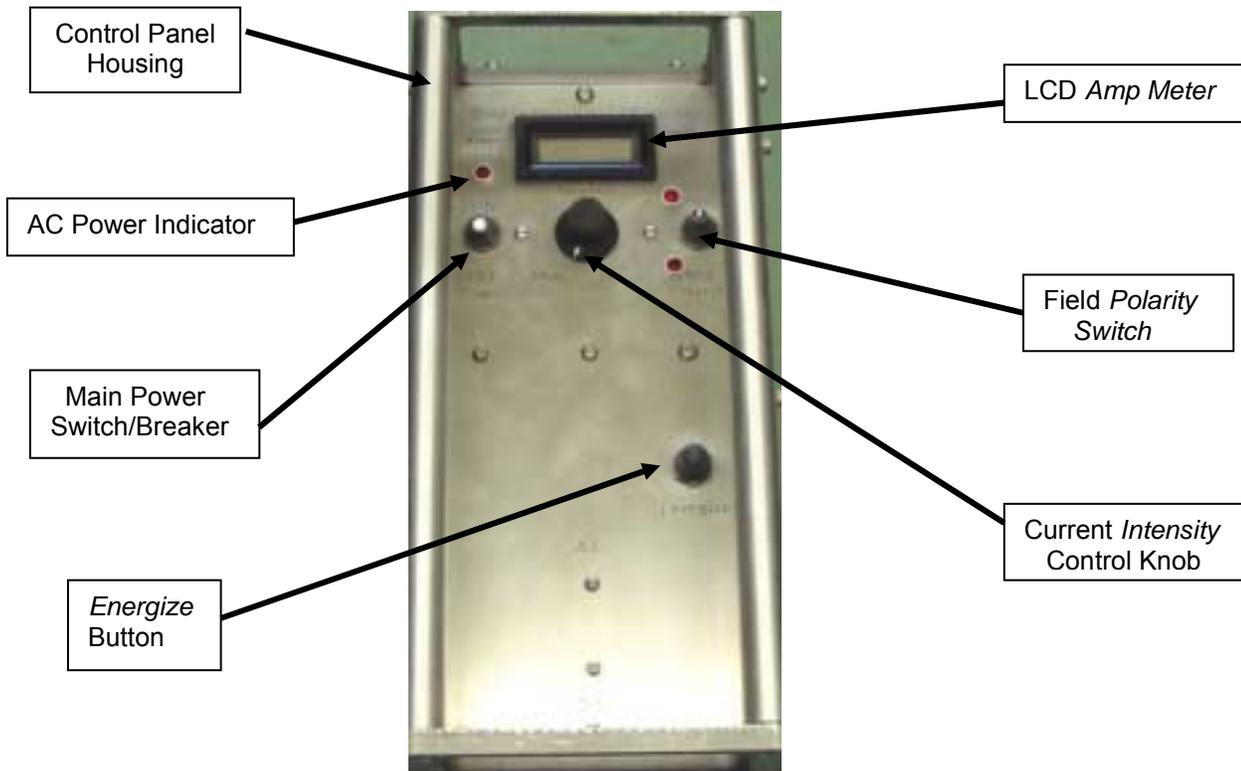
### **Variable Power Supply (WDV Coils)**

The Control Panel Housing used in the WDV Coils is slightly taller than that on the WDP Coils. The WDV panel is equipped with the following control components;

- a) *Power On/Off*, controls the AC power to the Coil's Control Components. This switch is a 15 Amp Breaker, that will kick out if the current draw exceeds 15 Amps. The red indicator shows the operator that the AC power is turned on.
- b) *Intensity Current Control Knob* allows the operator to control and monitor the amperage to the coil. The Amp Meter may not be completely linear, with respect to the knob position while the unit is not activated, but will indicate the actual current when the coil is energized. The Amperage, with respect to the knob position, is always indicated whenever the Main Power Switch is activated. The scale engraved on the control panel is not calibrated and is only used as a reference point for the operator.
- c) Calibrated LCD *Amp Meter* is 3 digits, and also indicates if the applied field is positive (+) or negative (-).
- d) *+/- Field Polarity Switch* requires the operator to pause between positive and negative fields, as the existing field in the coil needs to collapse prior to the opposite polarity being applied. The Field direction is switched from positive to negative to demagnetize a work piece or to enhance a residual magnetic field.

e) Push Button *Energize* switch is located adjacent to the Polarity Switch, and while depressed allows current to flow through the coil.

**Do not press the Energize Push Button when changing the Field Polarity Switch.**



Note: These Operating Instructions also apply to Separate Power Supplies provided as retrofits to other manufacturers Coil Assemblies. Western Instruments makes no claims or warranties when used with other manufactures Coils.

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

WDV Models should not be activated, using the Field Activation Switch, for more than 2 minutes 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 Core and Control Components from overheating. WD-Series Coils may be equipped with an optional Thermo-Protection Switch (Automatically resetting), bonded to the wire core, which opens when the core temperature exceeds the preset threshold. If the unit is used for extended periods of time, with short periods of activation, the operator should be mindful of the temperature of the coil housing. If the operator has any concern about the actual or planned operation of the Coil, Western Instruments or the Distributor should be consulted. No matter if the Coil is equipped the Thermo-Protection Switch or not, duty cycles must be observed.

**4. Field Characteristics** – WD-Series Coils are classified as DC units 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. WD-Series Coils are designed to

comply with specifications requiring Residual or Active Fields.

**AC Option** is designed to convert the Output Field from DC to AC. When configured to operate in *AC Mode*, the output of the coil is a minimum of 4000-Ampere Turns, but is size and input voltage dependent. The AC Option is only available where coils have been specifically manufactured with is capability.

**Pulsed DC Option** is activated with a switch on the Control Panel, immediately next to the Energize Button. When activated, the Coil automatically begins to Pulse at a rate of approximately 80 times per minute. The Amp Meter does not display the amperage while in Pulse Mode. The duty cycle, when in Pulsed Mode, is extended to 100% as the Coil is energized less that 30% of the time. Thus, while is Pulse Mode, the unit can be left on for extended periods of time. While in Pulsed Mode, all other functions continue to operate (Variable Amperage, and Reversible Polarity), but are typically not required during testing.

The Pulsed Option truly gives the operator the ability to perform an Active Field Inspection. The Pulses occur about every  $\frac{3}{4}$  of a second, with a very short duration. This way, the particles are 'jarred' every pulse, to give the particles that encouragement they need to congregate around cracks. Performing an Active Field Inspection with Pulsed DC will not just satisfy an auditor looking over the inspector's shoulder, but will actually help to produce faster and crisper indications.

**DO NOT CHANGE THE POLARITY WHEN THE PULSE SWITCH IS TURNED ON.**

## 5. 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 during (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, while in Residual Field Inspection there is no particle migration and greater skill and care must be taken in media application.

WDV Models 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, followed by an Active or Residual Field Inspection.

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.
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.

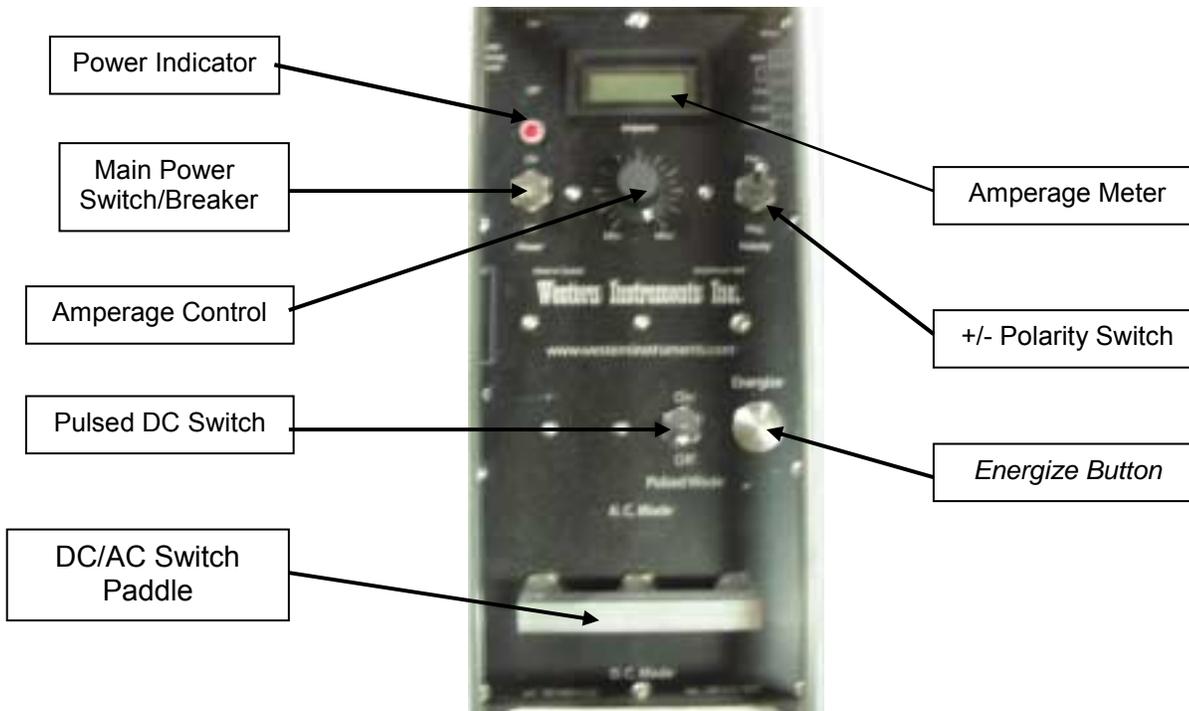
Note: Contact Western Instruments for more complete Demagnetization information.

The number of demag shots may be decreased or increased depending on; the amount of field induced during magnetization; the size; and the magnetic permeability of the Work Piece. 5 reversing cycles is an absolute minimum, but should rarely exceed 10 cycles. Operator experience will dictate the number of reversing cycles.

Operators should not try to be too quick in their reversing cycles, as reversing the field and energizing too quickly may result in damage to the controls

### AC Option (Optional)

The following illustrations of the control panel should be reviewed before reading further;



**DC/AC Switch Paddle** The dual position paddle is 3 standard switches 'ganged' together, to allow operators to select either DC Mode (normal operation) or AC Mode. For DC operation the paddle is in the down position (as shown), and is placed in the up position for AC Operation.

**Do not attempt to change the DC/AC Switch Paddle position with the *Energize Button* depressed!**

When the operator has finished testing the workpiece, he normally performs a reversing DC Demag Cycle as described above. When he is finished, and the work piece has a low residual field, he can fully demagnetize the workpiece by placing the coil in AC Mode.

**Changing Mode (AC to DC or DC to AC)** is achieved by simply changing the paddle position, however, do not touch the Energize switch for at least 1 second before or after changing the position of the paddle.

WD-Series Coils manufactured after August 2010 have a Variable AC function, similar to the DC function, however, the AC amperage is not indicated on the LCD. For Demag, the operator selects the AC Position of the paddle, and sets the amperage to maximum. The

Operator then energizes the Coil. With the Energize button pressed, and the Coil activated, the operator reduces the AC Amperage in a slow continuous motion. When the operator reaches zero, on the Amperage Intensity Knob, the energize button is released. At this point the field in the workpiece should be zero. If the field is not zero, then the operator started this AC Demag procedure with too much residual DC Field. We refer to this type of Demag as a Manual AC Ring Down.

The Duty Cycle of the unit 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.

**Caution:** The energy flowing through the internal Coil, in either AC or DC Modes, represents a great amount of stored energy, taking just under one second to dissipate after the power (*Energize* Button) has been turned off.

### Automatic Ring-Down (Optional).

The Automatic Ring-Down Option provides Reversing and Reducing DC Demag for the operator. Recognized as the most effective method to Demagnetize parts after Magnetic Particle inspection, the Ring-Down Option provides a faster means than the Manual Reversing and Reducing DC Demag capabilities of a standard WDV-Series Coil. The piggy-backed end control housing is equipped with the following controls;

#### 1. Mode

The Automatic / Manual Switch simply activates and deactivates the Automatic Ring Down Function of the Controls.

#### 2. Cycle Selection

The 4 position Rotary Switch allows the operator to select the total number of Demagnetization Steps in each Cycle. This is selectable between 5, 10, 15, and 20 Reduction (Amperage) and Reversing (Positive / Negative) settings in each Cycle. This control in turn sets the amount the Amperage is reduced between each step. Some might want to refer to this as the number of "Shots" in each cycle.

#### 3. Cycle Rate

This Potentiometer sets the time between Reduction and Reversing Cycles. Adjusting this time ensures the Field produced by the coil, and influenced by the mass of the workpiece, fully collapses.

#### 4. Indicator

The indicator lamp goes on when an Automatic Ring-Down Cycle is initiated, and turns off when the cycle is finished..

Setting the Automatic Ring-Down Function is straight forward to any inspector who uses a WDV-Series Coil to Magnetize, especially when it is used for Manual Reversing and Reducing DC Demag. The following are the steps one must follow;

- The Amperage of the coil is set to the level and polarity where the workpiece was magnetized at.
- The operator selects the desired Cycle Selection. If a particular part has not been automatically demagnetized before, a low number of Cycles is selected. If the part is not demagnetized after the minimum setting (5 Cycles) the operator does another cycle at the next higher setting.
- Normally keep the Cycle Rate at the minimum position, unless the workpiece is very

heavy. If the maximum Cycle selection does not Demag a part, then the operator should reduce the number of Cycles to the minimum and start over with an increase in the Cycle Rate.

- The Mode is then switched to Automatic.
- To start the Automatic Ring-Down cycle, the Energize Button is pushed once and released.
- The indicator light will go on at the start of the cycle and will turn off when the cycle is

**6. Maintenance:** After extended use, WD-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; Current Control Knob; and the power cord (cable). 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 amp meter assembly should be calibrated at regular intervals. Furthermore, during calibration the field produced by the coil should be tested to ensure there is no reduction in the performance of the unit.

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 an authorized service depot or Western Instruments.

### **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;

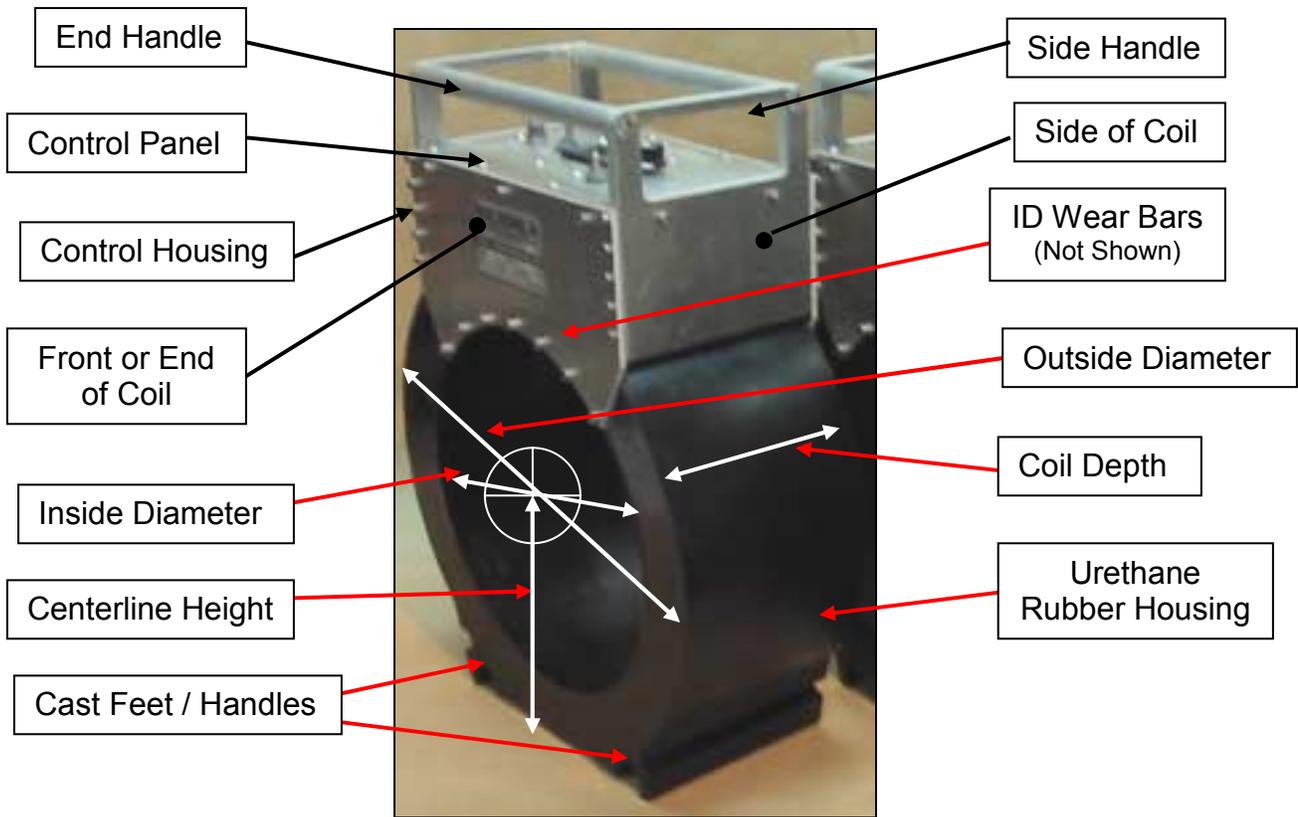
- Green – Ground
- White - Neutral
- Black – Live

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.

### **Calibration**

WD-Series Coils should have their Amperage Meter Calibrated annually or after control repairs have been made (power cords and plugs are not considered “Controls”). However, the customer’s Quality Manual or a Reference Specification may require more frequent Calibrations. North American customers can have calibrations made at an Authorized Service Centre. International customers may not have a Service Centre located in their region, so a qualified company must be found. A company that repairs Industrial Electrical Controls should have the necessary expertise to perform a calibration. If Western Instruments is provided appropriate documentation, the Calibration Procedure can be provided to such a company.

# WD-Series Coil Nomenclature



**Warranty:** Western Instruments warrants all WD-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 unauthorized 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 WD-Series Coils, refer to the Operating Instructions, furthermore we recommend instructional training to IPIA qualifications. 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: WDV-Series;

60 Hz Models – WDV-8, WDV-10, WDV-14, WDV-16, WDV-18, & WDV-25

50 Hz Models – WDV-8K, WDV-10K, WDV-14K, WDV-16K, WDV-18K, & WDV-25K.

Voltage: 115 VAC - 60 Hz or 230 VAC - 50 Hz (Nominal).

\*WDV-16, WDV-18, and WDV-25 are 230V (50 or 60Hz) only.

Current: 60 Hz Models– WDV-8 and WDV-10: 0 to 13 Amps, WDV-14: 0 to 15 Amps  
WDV-16: 0 to 18 Amps, WDV-18: 0 to 20 Amps, WDV-25, 0 to 26 Amps.

50 Hz Models – WDV-8K and WDV-10K: 0 to 7 Amps, WDV-14K: 0 to 8 Amps

WDV-16K: 0 to 10 Amps, WDV-18K: 0 to 11 Amps, WDV-25: 0 to 14 Amps.

Capacity: WDV-8 and WDV-10, 0 to 11,000 Amp Turns, WDV-14, 0 to 14,000 Amp Turns

WDV-16, 0 to 16,000 Amp Turns, WDV-18, 0 to 18,000 Amp Turns,

WDV-25, 0 to 25,000 Amp Turns.

\*With the AC Option, the output for all models is over 4000 Amp Turns.

ID Size: 8 ½ (219mm), 10 ½" (270mm), 14" (355mm), 16" (406mm), 18" (457mm), and  
25" (535mm).

Depth: All Coils are 6" (152mm), Control Panel is 6 ½" (165mm).

Weight: WDV-8, 40 Pounds (18kg), WDV-10, 45 Pounds (21kg), WDV-14, 55 Pounds (25kg),

WDV-16, 110 Pounds (50kg), WDV-18, 205 Pounds (94kg), and

WDV-25, 352 Pounds (160kg).

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