

# Western Instruments

Established 1965

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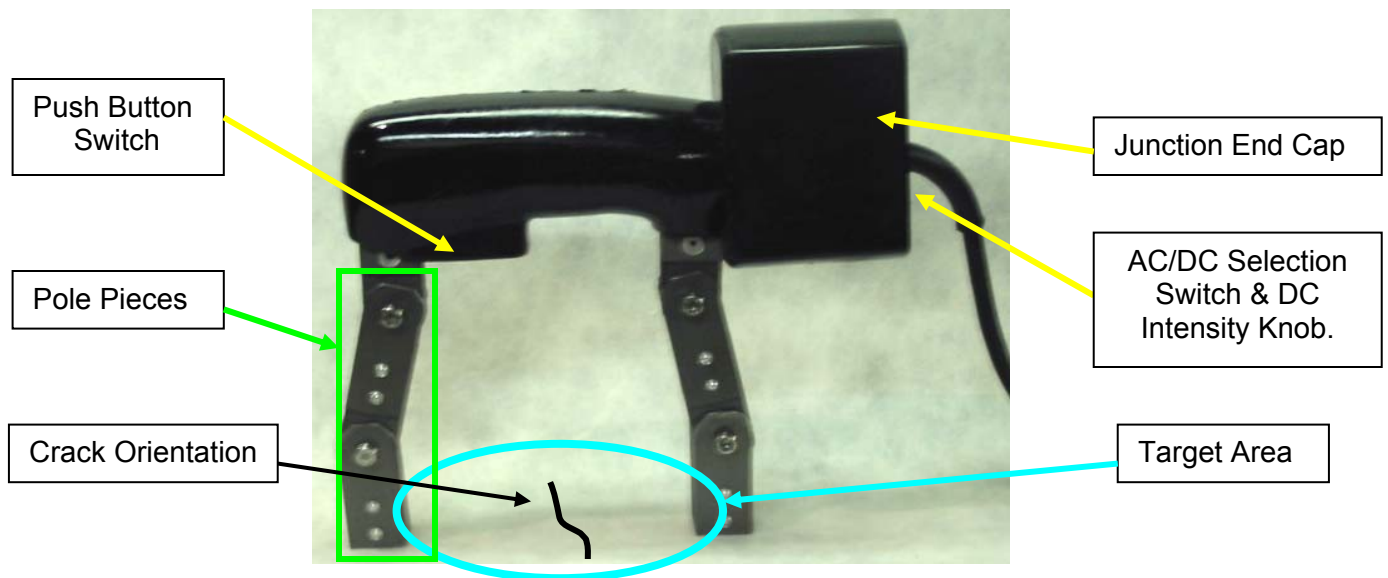
## Operating Instructions



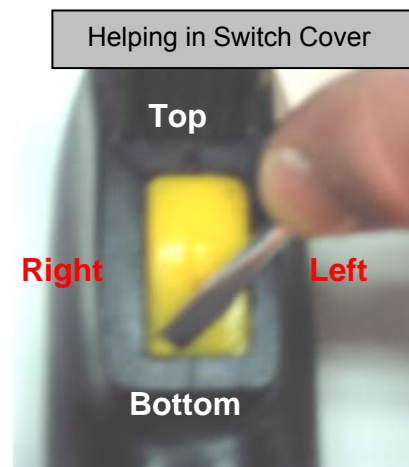
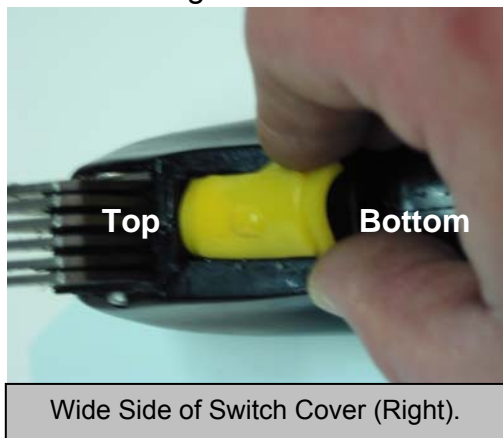
# WE-7

## Compact AC/DC Yoke

The WE-7 allows the Operator to induce an AC or a pulsed DC field into the ferrous material being tested. The device should be utilized within the parameters set by the operational specifications within this guide.



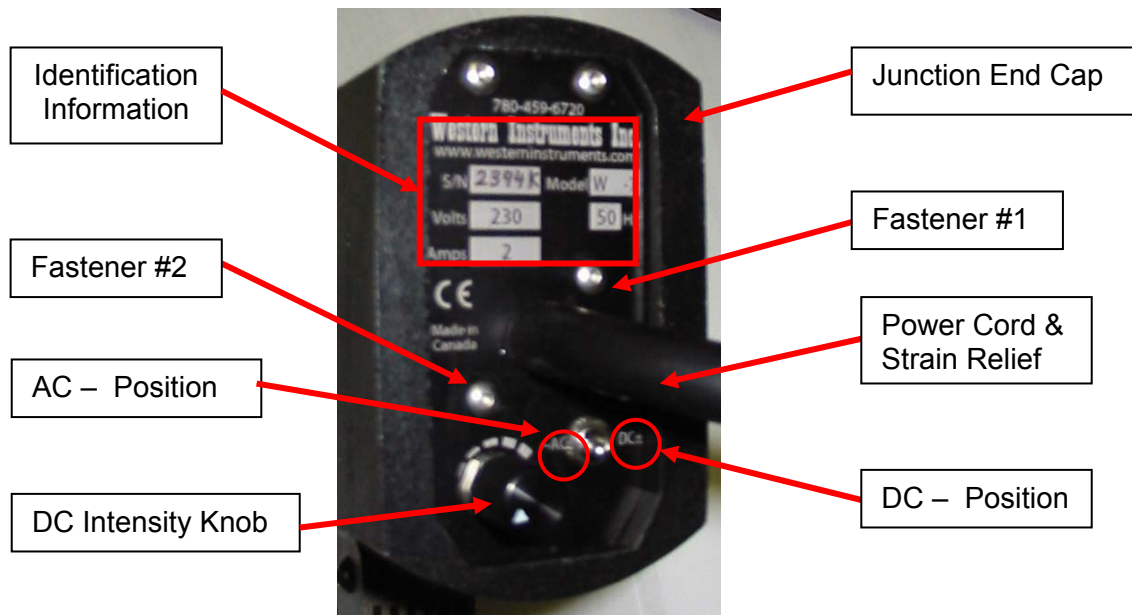
- 1. Push Button Switch** – The Lycon (#11-304) Micro-Switch is the same style of switch used in all Standard Yokes (WE-Series and Competitive units). This style of switch has no grounding provision, so care must be taken by the operator while performing Wet Method Inspection. The Switch Housings on WE-Series Products were designed for comfort and safety. While depressed, the switch delivers power (AC) to the coil encapsulated in the Yoke housing. Review the instructions in this guide, for switch replacement.
- 2. Slip-In Switch Cover** – The Slip-In Switch Cover is exclusive to WE-Series Yokes. To remove the cover, simply *pinch* the cover and pull it out. While the Slip-In Switch Cover provides superior resistance to moisture ingress, than mechanically fastened switch membranes, it must be regularly removed to clean the Switch and Housing, during wet method inspection, This cleaning will aid in the avoidance of operator shocks.



The cover is designed to fit best into the cast groove with the wide side to the right (as illustrated) of the Yoke body. Furthermore, the feeler button, on the raised portion of the switch cover is farthest away from the switch connections. To insert the Switch Cover, bend the cover longitudinally, and slip the top of the cover into the groove. Use a small screwdriver to *help* the bottom of the cover into the groove after the top is in place. During factory assembly, the cover is slightly lubricated/moistened. Ensure the lubricant does not dry, and create a vacuum in the Switch Cavity, which causes the Switch to stick.

**3. Field Selection** – The WE-7 provides the operator with either an AC or DC Field, simply by changing the position of the AC/DC switch on the Control Panel. While in DC mode, the Field Intensity is Infinitely Variable, with the use of the Intensity Knob, which is also located on the Control Panel. An illustration of the Control Panel is show bellow.

**DO NOT CHANGE THE FIELD WITH THE PUSH BUTTON DEPRESSED**



Mounted to the rear of the Control Panel, and inside the Junction End Cap, are the Control Board and Heat Sink. To remove the Control Panel and Junction End Cap, Fasteners #1 and #2 are the only ones to be removed. The Control Printed Circuit Board directs AC voltage directly into the Yoke's Coil (AC Mode) or Converts it to DC and again directs it into the Coil (DC Mode). The DC Intensity Controls are contained on the same Printed Circuit Board, and adjusts the DC Voltage and thus the lifting power of the Yoke.

Adjusting the DC Intensity Knob while the Yoke is activated is completely acceptable. However, the Field Selection Switch (AC/DC) should not be touched while Yoke is turned on. If the Field Selection Switch is changed when the Yoke is on, an overload may occur. When overloaded, the Control Printed Circuit

Board may fail, resulting in a partial or complete failure to this component, and/or the electrical breaker the Yoke is supplied from (Mains) may be tripped.

**DO NOT CHANGE THE FIELD WITH THE PUSH BUTTON DEPRESSED.**

- 4. Operational Parameters** – The Operational Parameters or Duty Cycle for the WE-7 operation is set to avoid damage to the internal coil or the Control Printed Circuit Board, and must be observed.

**AC Operation:** It is recommended that the operator does not keep the Yoke on for more than ½ hour at a time, as the Yoke housing may get too warm to hold. However, the basic design of any Yoke inherently produces heat. Typical operation is 5 - 15 seconds on, while applying inspection media, followed by 5 - 15 seconds off repositioning the yoke to the target area.

**DC Operation:** At the maximum setting, the Yoke should not be kept on for more than 10 minutes at a time, and should be followed by an equal cool down time. Typical operation is 5 - 15 seconds on, while applying inspection media, followed by 5 - 15 seconds off repositioning the yoke to the target area. In this typical operation the unit can be operated for extended periods of time, however the Yoke housing may get too warm to hold.

If the Yoke is used for prolonged periods of time of continuous cycling, such as 2 to 3 hours in AC mode or 60 to 90 minutes in DC mode, as outline above, the Yoke may get hot. If the WE-7 is used in this manner the operator must provide time for a sufficient cooling period, or components in the Electronic Control Module may fail.

**Do not change the FIELD SETTING while the unit is activated.**

## **5. Field Characteristics**

**AC Field** – AC Magnetic Fields are sensitive to surface and near surface defects due to the 'Skin Effect' as the field travels from one Pole Piece to another. The Inspection Media (Dry Powder or Wet Method Particles) has a tendency to migrate toward interruptions (or defects) in the field. The direction and intensity of an AC Field, by its nature, alternates causing high particle mobility, so defects tend to be revealed immediately.

**DC Field** – The Pulsed DC Magnetic Field is stronger than an AC Field and tends to penetrate the work piece more deeply, however DC is still sensitive to surface defects. Inspection media tends to adhere to the entire target area of the work piece, due to the reduced particle mobility, and may need to be 'blown off' to fully reveal an indication. The intensity of a DC Field, by its nature, is fixed but the Yoke does Pulse the field providing some stimulus for the particles to migrate to defects.

**Demagnetization** – Small Parts may be demagnetized by positioning the contact surfaces of the Pole Pieces together, activating an AC Field and pass the part through the opening formed between the Legs and Yoke Housing. Larger Work

Pieces can be demagnetized by placing the Yoke on the surface, in a similar manner used during inspection, activating an AC Field and pull the Yoke off the surface. The work piece can be tested with a Magnetic Field Indicator, such as the W-Series W-PT®, to ensure it is fully demagnetized.

## **6. Operation:**

Select the desired field on the WE-7, and position the Pole Pieces (Feet) on the work piece. The area between the pole pieces is your target area, which also extends laterally out, approximately 1.5" (38mm), from either edge of the pole pieces. The Field will expose defects that are transverse to the centerline between the Pole Pieces. The Pole Pieces should be positioned, so that as much of their contact surface as possible is in contact with the work piece. The Yoke is then energized, by pressing the Push Button Switch, and Magnetic particles are applied. Dry Method Particles are dusted between the Pole Pieces and over the target area, while Wet Method Particles are sprayed in a similar manner.

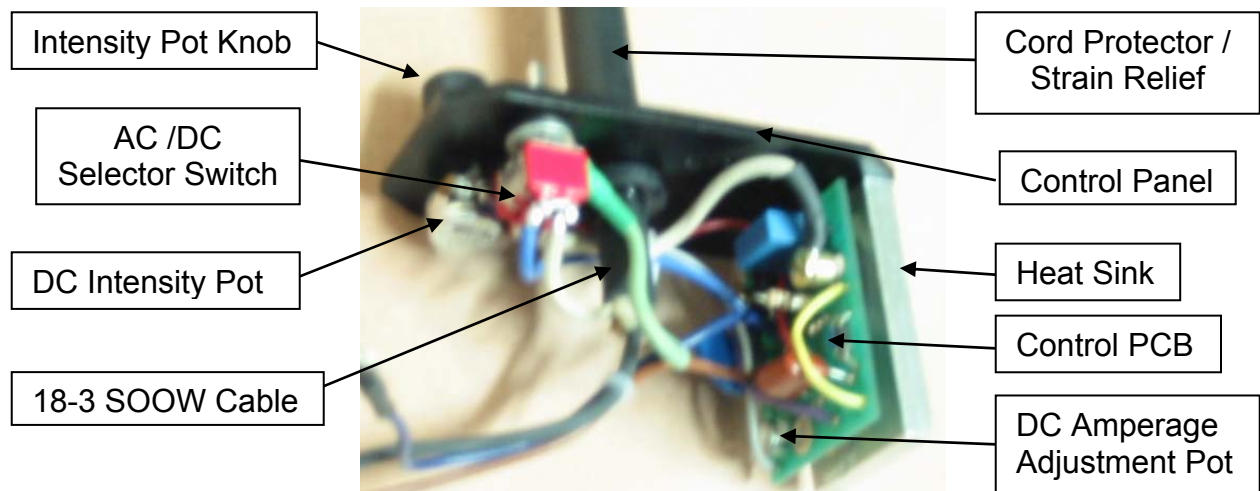
The area is then inspected visually for a collection of Particles around defects. A Black Light is used to aid visual inspection when Fluorescent Particles are used. Indications found with Dry Powder and an AC Field will tend to form immediately, and will take slightly longer with Wet Method Particles. While using a DC Field, Dry Method particles behave similar to AC, but Wet Method Particles tend to flow far slower requiring a longer activation time. If the typical direction of defects is not known, rotate the Yoke through 90° and repeat the inspection of the target area. Follow the Operational Parameters outlined in these instructions, and again;

**Do not change the FIELD SETTING while the unit is activated.**

## **7. Maintenance**

After extended use the Yoke should be cleaned with a mild soap solution and thoroughly dried. The unit should be visually inspected for any damage that could cause harm to the operator, or the material being inspected. Special attention should be paid to the Push Button Switch Cover, to ensure it is fully inserted to the groove cast in the Switch Cavity. Furthermore, the Power Plug, Power Cord, Strain Relief, and the Junction End Cap should be in a good state of repair. Before performing maintenance or the Yoke should be disconnected from any power source, with safe industrial practices employed. Any potential problems to these assemblies must be reported to the Distributor or Western Instruments for instructions on corrective action.

If there is a failure in the Control Printed Circuit Board, the Control Panel may be removed. Repairs to this component are not a field fix (as illustrated bellow), even if an extra Board is on hand. Replacement requires fine tools, and furthermore there are adjustments on the Board that require a Clip-on Amp Meter and a Digital Multimeter.



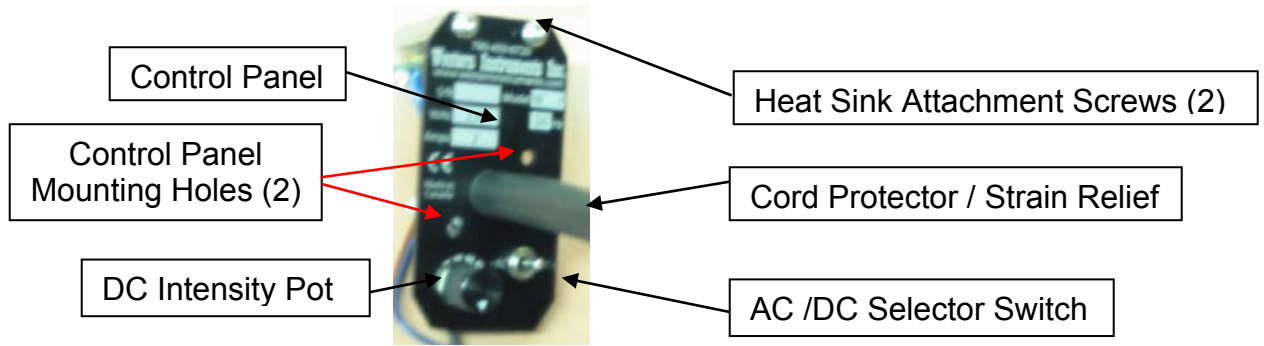
The WE-7 has had several series of Printed Circuit Boards manufactured for use with this model. While function of the PCB has remained the same, the design, component selection, and physical mounting has changed. If an older series of PCB is to be changed, it is recommended that the Heat Sink also be changed. The mounting of the Heat Sink to the Control Panel has remained unchanged.

There are 2 possible outcomes of damage to this assembly.

1. After about 2500 hours of continuous use, the Cable or Strain Relief may become damaged due to age or abuse. The Power Cord and Strain Relief are first assembled. The wires on the cable are then striped to the necessary length, and their ends prepared in the same fashion as originally assembled. The Cord and Strain Relief are then pulled through the Control Panel until the Strain Relief's Flange is tight to the inside of the Panel. An appropriate AC Plug is installed on the Mains end of the 18-3 SOOW Cable (which is approximately 10mm / 0.375" in Diameter).
2. Typically an operator will move the AC / DC Selector Switch when the Yoke is activated. This action will typically cause one or more of the Semiconductors on the PCB to fail. The repair Technician can then either rework the PCB, or purchase a new board. When removing and reinstalling the Board, ensure heat conductor paste is used in the appropriate spots, and that the original fasteners (Nylon and Metallic) are used in the appropriate locations.

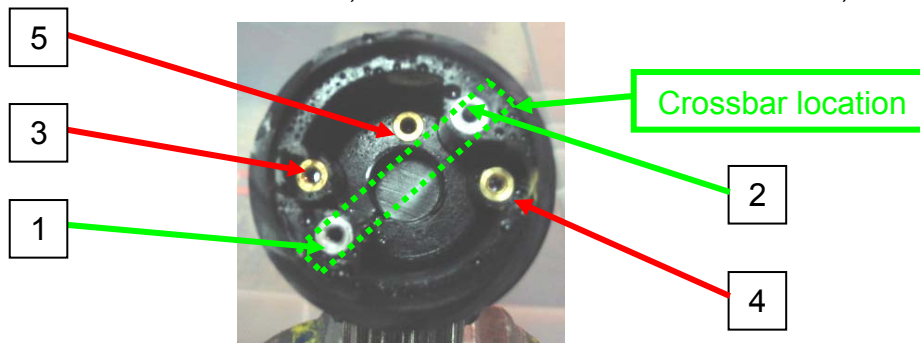
When the Repair Technician is ready to reinstalling the Control Panel ensure the *DC Amperage Draw Potentiometer* is adjusted correctly so the Yoke will lift 23 kg (50 Pounds) when the *DC Intensity Pot* is adjusted to maximum setting. The Repair Technician must first ensure the Yoke will lift 4.6 kg (10 Pounds) in AC Mode, to ensure the Contact Feet (Pole Pieces) are ground flat. The Repair Technician must take care when activating the Yoke with the Control Panel not fastened to the Yoke, as the Ground is not connected. For directions to properly measure Amperage Draw, contact Western Instrument or your Dealer.

The alignment of the Control Panel to the corresponding receptacles that are cast into the Yoke housing may not be perfect. Care must be taken to 'start' both mounting fasteners at the same time, and slowly tighten them together to ensure the receptacles 'give' (or move



together) to align themselves to the Control Panel. The Repair Technician should take note of this if the entire Cord Set is being replaced.

Located inside the Junction Tube, at the rear of the WE Yoke housing are 5, #6-32 fastener receptacles. This is illustrated below, with all wires and hardware removed;



These connections are used for the following purposes;

- 1 and 2 are used for connecting the Stand-Offs that support the Cross Bar.
- Note: The **Ground** Wire (Green) from the Power Cord is connected to the Control Panel, which in turn is connected to the Stand-Offs / Cross Bar and ground.
- 3 is used to connect the **Control** Wire (Blue),
- 4 is used to connect the **Power** Wire (Black) to the Switch.
- 5 is for connecting power from the switch (Brown) to the Control Board.

Note: -For trouble shooting purposes the Repair Technician can note that the finger activation Switch (Licon #11-304), is connected between 4 and 5.

For directions on how to trouble shoot a WE-Series Frame, contact Western Instrument or you Distributor.

### Parts Descriptions;

- Complete Assembly
- Flat Rate to rebuild existing assembly
- WE-7 Control Housing (Cast Reinforced Urethane)
- Power Cord
- Strain Relief
- PCB (installed on Heat Sink)
- AC /DC Selector Switch
- DC Intensity Pot
- Knob for Pot
- Heat Sink
- Control Panel

Whether industrial specifications are being observed or not, the Yoke should be tested periodically, using a certified Pull Test Bar such as the W-Series W-PT®, to ensure it continues to lift the specified amount of weight. If the unit fails such a test, first inspect the Pole Pieces to ensure they fully contact the test weight. If the unit continues to fail, contact the Distributor or Western Instruments for instructions on corrective action.

### **Wiring**

W-Series 230 Volt Models, are designated by a “K” placed after the Serial Number and the Model number (e.g. WE-7K), 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

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.

## **8. Warranty**

Western Instruments warrants its products, against defects in materials and workmanship for a period of 1 year 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. Consumable items, such as Batteries are warranted for 30 days, from receipt by the end user.

Any warranty is void if the unit has been modified in any way, 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. All 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 the product, refer to the Operating Instructions, furthermore we recommend instructional training to CGSB, ASNT, or other regulatory authority qualifications. Western Instruments highly recommends the end user exercise all possible safety precautions, including use of protective equipment, while operating this or other industrial equipment.



### Specifications:

Models WE-7 or WE-7K  
Voltage: 115VAC or 230VAC  
Frequency: 50 or 60 Hz  
Current: 4 Amps @ 115 Volts, 2 Amps @ 230 Volts  
Controls: Switch, DC via SCR and Phase Angle Control  
Capacity: AC - <10 Pounds (4.6 kg)  
DC - <50 Pounds (23 kg)  
Pole Spacing: 0 – 11" (0 – 280mm)  
Pole Cross Section 1" (25mm)  
Weight: 7.5 Pounds (3.4 kg)



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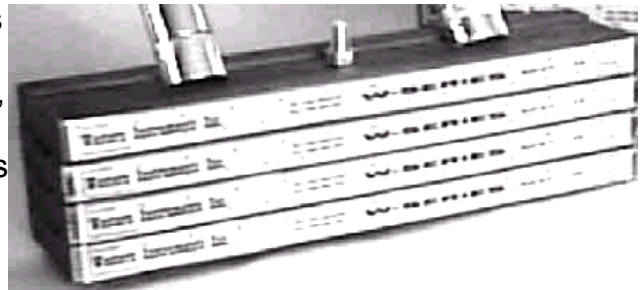
E-mail: [info@westerninstruments.com](mailto:info@westerninstruments.com) Web: [www.westerninstruments.com](http://www.westerninstruments.com)

### W-PT Pull Test Bar



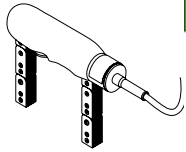
The Pull Test is the fastest way to verify the operation and specification compliance of MPI Yokes. Western's W-PT is designed for ease of use with AC Yokes (10 Pounds or 4.6Kg) where just one Bar is required.

For Yokes using the DC Method, several Bars are conveniently stacked and fastened, as illustrated to the right. The requirements vary, depending on the Reference Specifications. *ASME Section V, Article 7* requires 40 Pounds or 18.2Kg. ASTM E709 and E1444 require 30 Pounds for a Pole Spacing of up to 4" and 50 Pounds for a Pole Spacing up to 6".



All W-PT's have Serial Numbers, and are supplied with Certificates of Compliance.

Pull Testing is fast and easy with any AC Yoke, however operators must be mindful of Pole Spacing with DC Yokes. Virtually all specifications limit Pole Spacing to 6" (150mm) with a DC Yoke, for very good reason. As the poles of a DC yoke are moved apart the flow of flux, from the positive pole to the negative pole, progressively reduces. When the poles are spaced beyond this maximum distance the flux flow will stop, thus changing the field characteristics drastically and not allowing indications to form.



# Western Instruments

July, 2012

Established 1965

## W-FI Field Indicators (Magnetometers)

Western Instruments manufactures 3 models of Disposable Field Indicators, which provide readings in *Gauss*;

1. W-FI-10 Intended to be used for Demagnetization and are calibrated during manufacture in a Homogeneous Field (**Helmholtz Coil +/- 10 Gauss**).
2. W-FI-20 Intended to check residual fields on small parts, and are calibrated during manufacture for a Homogeneous Field (**Helmholtz Coil +/- 20 Gauss**).
3. W-FI-50 Intended to check residual fields on heavy parts, and calibrated during manufacture for a Homogeneous Field (**Helmholtz Coil +/- 50 Gauss**).

The Certification Decal, illustrated below, is affixed to the back of every W-FI, and the date of shipment is etched onto the decal. The Certification Decal reads as follows;



Field Indicator (Magnetometer), as outlined in the *ASNT Edition, Volume 6*) and Defined in ASTM E 1316, is measure the Relative Intensity of a Magnetic Field (measured before or after Magnetic Particle Inspection. At the time of   /  /  , the accuracy of this W-FI was confirmed to be within +/-1 Gauss or 5% of the scale value, whichever is greater."



A magnetic field of under 10 Gauss is typically not strong enough for Magnetic Particle Inspection (MPI), thus the W-FI-10 is used to ensure a workpiece is demagnetized. A magnetic field, for MPI, should be approximately 18 to 24 Gauss, thus an inspector uses the W-FI-20 to ensure his field is strong enough. A workpiece can be magnetically saturated prior to or after inspection, and these strong fields are evaluated with a W-FI-50.

Contact your Western Instruments Full Line Distributors to learn more about our other Yokes, Portable Coils, Portable Kits, and other Magnetic Particle Inspection Accessories. If you have a questions, visit our Web Site, were you will find over 150 specific Documents related to our Portable MPI Equipment.